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MONTEIL (L.). **Les insectes nuisibles au cotonnier en Afrique équatoriale française.**—*Agron. colon.* no. 193 pp. 11–18. Paris, January 1934.

Notes are given on various insect pests of cotton observed in French Equatorial Africa. Severe injury is caused by *Locusta migratoria migratorioides*, R. & F., and another Acridid, *Acanthacris ruficornis*, F., has often been observed severing the young woody shoots. In some fields, 5 per cent. of the seedlings and newly thinned plants have been destroyed by *Brachytrypes membranaceus*, Drury, in July and August; one individual may cut through 10 seedlings or 4–5 young plants bearing flower-buds. The only effective means of control is the collection of the crickets in the underground tunnels in which they hide during the day [*cf. R.A.E.*, A **16** 408]. Mining larvae of Buprestids, probably *Sphenoptera* sp., cause considerable damage; adults of *S. solida*, Jak., *S. longiuscula*, Lap. & Gory, *S. trilineata*, Beauv., *Sternocerca klugi* var. *zechiana*, Kolbe, and *Psiloptera umbrosa*, F., were collected on severely injured flowers. The Meloids, *Coryna* (*Mylabris*) *hermanniae*, F. (*affinis*, Ol.) and *C.* (*Zonabris*) *guineensis*, Mars., are very common and destroy numbers of cotton flowers. Weevils, such as *Alcides gossypii*, Hust., and more commonly *Myllocerus* spp., including *M. hirtipennis*, Hust., are abundant, particularly in the dry season in November–December. The Eumolpid, *Syagrus calcaratus*, F., the Galerucid, *Laetana histrio*, Baly, and other leaf-eating beetles are common during the rainy season, particularly in August–September; at the beginning of the dry season their numbers diminish, and after the burning of the ground in December–January they are very rare.

The Tineid, *Acrocercops bifasciata*, Wlsm., is abundant throughout the cotton zones, where it was first recorded in 1923. The eggs are laid on the lower surface of the leaves, in which the larvae mine [**4** 7], causing the upper surface to assume a typical blistered appearance. Pupation generally occurs on the leaf, and the life-cycle occupies 22–25 days. Injury is particularly severe on young seedlings. Regular destruction of infested leaves is the only method of control [*cf.* **14** 8].

In laboratory observations on *Sylepta derogata*, F. [*cf.* **13** 461], the egg-stage lasted 5–8 days, the larval 17–24 and the pupal 6–9. None of the adults observed lived more than 5 days. The injury caused to the leaves by this Pyralid is most serious during the flowering and fruiting season (August–October). Thorough and continuous collection of eggs and larvae from the beginning of the outbreak is recommended. Certain varieties of cotton are more resistant to attack than others [*cf.* **17** 297].

Earias insulana, Boisd., which is generally distributed, appears in August when the plants flower and remains abundant until the fruiting stage in September–October, after which it is rarely seen. At least 4 generations occur during the cotton season (July–December). *E. biplaga*, Wlk., is much less numerous. Little injury has recently been caused by *Heliothis obsoleta*, F., and *Prodenia litura*, F., although they exist throughout the cotton zones. *Diparopsis castanea*, Hmps., is very abundant on cotton, and, like *Earias*, also feeds on *Hibiscus cannabinus*. The damage it causes increases as the season advances and is most severe when large, almost mature bolls are attacked. The Pentatomid, *Glypsus conspicuus*, Westw., which is said to prey on bollworms [**20** 624], is abundant in the region investigated, but its predacious habits have not been confirmed.

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The Lymantriid, *Naroma signifera*, Wlk., is present throughout the cotton zones, feeding principally on the flowers and pupating either on the plant or in the soil. The egg-stage lasts 6–8 days, the larval 14–18, and the pupal 10–12. *Xanthodes* (*Acontia*) *graellsi*, Feisth., lays its eggs on the lower surface of the leaves, and the larvae pupate in the soil. In the laboratory in July–October, the egg-stage lasted 14–18 days, the larval 30–34 and the pupal 12–14. The larvae of this Noctuid, which feed on the leaves and sometimes the flowers, are most numerous during the rainy season (July–October). *Brithys* (*Glottula*) *pancratii*, Cyr., a polyphagous Noctuid recorded from several localities in French Equatorial Africa and from the Belgian Congo, where it is one of the principal pests of maize, causes slight injury to cotton in September and October. The egg-stage lasts 11–13 days, the larval 19–23 and the pupal (in the soil) 12–14.

A Jassid, possibly *Empoasca* (*Chlorita*) *facialis*, Jac., appears when the cotton comes into flower and is found throughout the season on the leaves and young shoots, causing crinkling of the foliage and withering of the extremities. As a potential vector of diseases, it deserves further study. Certain varieties are more resistant to it than others. *Dysdercus nigrofasciatus*, Stål, has only been observed in one region, on native cotton, but *D. superstitiosus*, F., is abundant throughout the cotton zone. The life-cycle (egg to egg) in one locality was 20–28 days in August and 20–22 in September–October. Stainers appear on cotton in August as soon as the bolls begin to form, become very abundant in September and decrease rapidly in October–November. *Gossypium barbadense* is more susceptible to their attack than *G. hirsutum*. Natural enemies observed locally are the Reduviid, *Phonoctonus principalis*, Gerst., and *Lygaeus rivularis*, Germ.

Minor pests are the Pyralid, *Margaronia* (*Glyphodes*) *indica*, Saund., the Limacodid, *Negeta luminosa*, Wlk., the Cossid, *Zeuzera* (*Azygophlebs*) *boisduvali*, H.-S., the Coreid, *Anoplocnemis curvipes*, F., the Pyrrhocorid, *Odontopus sexpunctatus*, Lap., the Lygaeid, *Oxycarenus hyalinipennis*, Costa, and *Aphis gossypii*, Glov.

DE FLUITER (H. J.). **Over** *Nygmia phaeorrhoea* **Donovan, den bastaardsatijnvlinder, en de factoren, welke tijdens de winterrust de getalsterkte van dit insect decimeeren.** [On the Brown-tail Moth and the Factors reducing its Numbers during Hibernation.]—*Tijdschr. PlZiekt.* **40** no. 1 pp. 1–35, 1 pl., 41 refs. Wageningen, January 1934. (With a Summary in English.)

An outbreak of *Nygmia phaeorrhoea*, Don., occurred in Holland in 1927–31, serious injury being caused to fruit and other trees and to sea-buckthorn [*Hippophaë rhamnoides*] in the coast dunes. In investigations on the factors affecting its hibernating larvae, few survived in winter nests kept experimentally at a high degree of humidity, and rainfall data recorded at Roermond from 1917 to 1932 support the conclusion that they are relatively scarce after a wet winter and spring. Low temperatures were of hardly any importance.

Overwintered females of *Monodontomerus aereus*, Wlk., which is probably a hyperparasite [*cf. R.A.E.*, A **19** 739], emerged from the winter nests. *Eupteromalus nidulans* (Först.) Thoms. [*cf.* **18** 151], which appeared later, is a primary parasite of *N. phaeorrhoea*; 844 examples were obtained from 29 nests collected near Roermond. It may also be a hyperparasite [*cf.* **19** 655]; when parasitising *Apanteles*

glomeratus, L., bred from pupae of *Pieris brassicae*, L., it had a life-cycle of 48–56 days. Adults were kept alive for three months. *Meteorus versicolor*, Wesm., which parasitises all instars, was reared from larvae that had left the winter nests. Its pupal period lasted 10 days, the pupae being heavily parasitised [*cf.* **21** 381]. The adults lived for over a month on honey and water. The importance of these parasites is, however, negligible.

The numbers of hibernating larvae of *N. phaeorrhoea* varied from 99 to 2,115 in a winter nest, with an average of 743. Destruction of the nests is the most effective control measure. As the larvae leave them over a prolonged period, the use of insecticides would be too costly.

Blunck (H.), Bremer (H.) & Kaufmann (O.). **Untersuchungen zur Lebensgeschichte und Bekämpfung der Rübenfliege** (*Pegomyia hyoscyami* **Pz.). 11. Mitteilung : Die Lebensgeschichte der Rübenfliege.** [Investigations on the Life-history and Control of the Beet-fly. Eleventh Communication.]—*Arb. biol. Reichsanst.* **20** no. 5 pp. 517–585, 19 figs., 2 pp. refs. Berlin, June 1933. [Recd. February 1934.]

The data given on *Pegomyia hyoscyami*, Panz., in Germany were obtained in a series of studies [*R.A.E.*, A **17** 250, 599] that have now been discontinued.

Embryonic development was not affected by light, moisture or dryness. At 28–29°C. [82·4–84·2°F.] it took 2–2½ days, and at 8°C. [46·4°F.] 13–15 days. At 28°C., hatching began only at a relative humidity of over 75 per cent. ; from 86 per cent. upwards, it was normal. On the transpiring surface of beet leaves, the eggs are continually enveloped in water-vapour, so that hatching is unlikely to be often delayed by drought in Germany, at least in spring. In summer and in arid districts, the unhatched larvae may be killed by desiccation.

The larva usually mines directly from the egg into the leaf. The method of larval boring and feeding is described. Lack of chlorophyll in the leaf is apparently injurious to the younger larvae, and this probably explains the avoidance for feeding and oviposition of young leaves. The larva may leave its mine, but at once seeks a suitable place to make another. Young larvae that fail to find one soon perish, but those about $\frac{1}{5}$ in. long are able to pupate in case of need. Owing to the small size of the plants, the first-brood larvae are more often compelled to emerge than others. The maximum distance that larvae could travel on the ground when seeking new plants was usually about 4 ins. Larvae completed feeding in 7 days at 28°C. and in 17–22 days at 14·5°C. [58·1°F.].

Of pupae in moderately damp earth, 56·5 per cent. were at a depth of 2–4 cm. and 33·9 per cent. above this. In the same earth well moistened, the corresponding percentages were 20·9 and 61·2.

Extremes of moisture and dryness appeared to have little effect on the viability of the pupae. Pupae kept 6 months under water developed normally, and the pupal parasite, *Opius spinaciae*, Thoms., was also unaffected. The pupal stage lasted longer in soil containing less air, so that earth that is water-packed or deeply ploughed may retard development. Pupae that had been formed a few days survived several weeks' freezing inside a block of ice. Of pupae from a fermenting heap of beet-refuse at 41°C. [105·8°F.], 50 per cent. produced adults. The threshold of pupal development was about 2°C. [35·6°F.] and the

thermal constant about 320 day-degrees C. [576 F.]; humidity was apparently of little effect within the limits found in soil in a moist climate.

The flies usually emerge in the forenoon. They fed on carbohydrates on various plants; in nature, they ingest water at the same time. They shelter from rain on the lower surface of the leaves, but heavy and especially lasting rain destroys them. Drought apparently acts only through the food-plant. The flies are most active in warm, sunny weather at 20–30°C. [68–86°F.], higher temperatures being unfavourable. They resisted low temperatures of −1°C. [30·2°F.], and an air-temperature of −3·5°C. [25·7°F.] was registered during oviposition in 1928 in Silesia.

Pairing, egg-formation and egg-maturation are described. The female prefers for oviposition leaves free from eggs and oviposits on the lower surface. In the laboratory, an average of 51·6 eggs per female was observed, with a maximum of 191. Unfertilised females laid only a few eggs, and these were sterile.

In summer, the total life-cycle lasts from 1 to 2 months. Three generations were observed in Pomerania. Winter pupae undergo a diapause of 7–8 months. In the laboratory, a high percentage of pupae of this generation entered a diapause even when kept at a temperature permitting development. This percentage, however, was markedly lower in the case of pupae previously exposed to frost. In spring, the adults appear in fields that have been under beet in the previous year, but in which this crop is no longer present. They therefore migrate in search of food and then of food-plants for the next generation. This migration does not occur in summer.

In conclusion, reference is made to investigations in Holland [**20** 710], many points of which confirm the work done in Germany.

BLUNCK (H.). **Beschädigung von Kartoffelknollen durch die Larve von *Phyllopertha horticola* L.** [Injury to Potato Tubers by the Larva of *P. horticola*.]—*Anz. Schädlingsk.* **10** no. 2 pp. 13–14, 2 figs., 9 refs. Berlin, February 1934.

An infestation of potatoes by *Phyllopertha horticola*, L., was observed in North Schleswig in October 1933, up to five larvae being found in large tubers. The larvae were also numerous on swedes and on oat stubble that had been ploughed under. They chiefly occurred at a depth of 6 inches or less, but some were found as deep as 13 inches. The adults had been unusually common in North Schleswig and in Denmark. The life-cycle appeared to be the same as in Brandenburg [*R.A.E.*, A **15** 515].

FRIEDERICHS (K.). **Regulierung der Heizung in selbstgefertigten Thermostaten.** [The Regulation of Heat in home-made Thermostats.] —*Anz. Schädlingsk.* **10** no. 2 pp. 21–22. Berlin, February 1934.

A simple device for switching the electric current on and off in home-made thermostats [*R.A.E.*, A **19** 126] is described. Strips of two metals of different expansion are welded together. When heated, the double strip becomes curved and, acting through a lever, establishes contact at temperatures between 10 and 30°C. [50 and 86°F.].

Reh (L.). *Cneorrhinus plagiatus* **Schall. als Gartenschädling** [as a Garden Pest].—*Anz. Schädlingsk.* **10** no. 2 pp. 22–23. Berlin, February 1934.

The shoots and leaves of strawberry and the shoots of fruit bushes were damaged by adults of *Cneorrhinus plagiatus*, Schall., near Hamburg in April 1933. The weevils also attacked beans and were numerous in dwellings. They had evidently migrated from neighbouring pines. Tobacco dust strewn under the plants was of no value for control ; the weevils sheltered in it by day instead of entering the ground. A pyrethrum dust, however, proved very effective.

Finkenbrink (W.). **Notizen über schädliche Käfer** [Notes on injurious Coleoptera] (*Sitodrepa, Tenebrio, Cneorrhinus*).—*Anz. Schädlingsk.* **10** no. 2 pp. 23–24. Berlin, February 1934.

Onion seed forwarded to the plant protection station at Rostock for inspection was found to be infested by *Sitodrepa panicea*, L., the larvae feeding and pupating inside the seeds, of which they destroyed less than one per cent. *S. panicea* also occurred in lettuce seed. Larvae of *Tenebrio molitor*, L., were found with *Attagenus pellio*, L., in occupied sparrows' nests on the wall of a warehouse containing a cereal cattle food. In May 1933, the adults of *Cneorrhinus plagiatus*, Schall., destroyed a field of young brussels sprouts by feeding on the leaves.

Samoggia (A.). **Reperti morfologici e biologici sul** *Trochilium tipuliforme* **Clerck (Lepidoptera-Aegeriidae).**—*Boll. Lab. Ent. Bologna* **6** pp. 131–150, 12 figs., 1 pl. Bologna, 30th December 1933.

Descriptions are given of the morphology of the egg, full-grown larva, pupa and adults of both sexes of *Aegeria* (*Trochilium*) *tipuliformis*, Clerck, a cosmopolitan species the larvae of which mine in the branches of red currant and gooseberry near Bologna, and of hazel (*Corylus*) in other parts of Italy and in Sardinia. Near Bologna, the adults begin to emerge at the end of May or early in June. In captivity, they were not seen to feed and only a few survived for 18 days. Dissected females contained from 36 to 53 eggs. The eggs are laid in cracks, etc., of the bark near forks of branches. The larvae bore to the centre of the branch and then follow the pith. They complete their growth in the following spring and then pupate in cell-like exit-channels about mid-April, the adults emerging about 40 days later. Of the recorded parasites, a list of which is given, those reared by the author were *Microbracon* (*Bracon*) *triangularis*, Nees, *Apanteles* sp. and *Eurytoma* sp.

In some years, the entire red currant crop is destroyed and that of hazel much reduced. Such outbreaks are, however, only occasional, and usually this Aegeriid is unnoticed owing to the action of parasites, especially *M. triangularis*. The only feasible control measure is cutting off and burning infested twigs, which are easily recognisable by their withered leaves.

Haseman (L.) & Meffert (R. L.). **Are we developing Strains of Codling Moths resistant to Arsenic ?**—*Res. Bull. Mo. agric. Exp. Sta.* no. 202, 11 pp., 1 fig., 15 refs. Columbia, Mo., August 1933. [Recd. February 1934.]

Investigations were undertaken in Missouri during the winter of 1931–32 to determine the minimum dosages of sodium arsenite and acid

lead arsenate lethal to hibernating larvae of the codling moth [*Cydia pomonella*, L.], which were kept at room temperature for a day before the experiment, and to discover if the strain of this moth from Colorado was able to withstand larger doses of arsenic than those from Virginia or Missouri [*cf. R.A.E.*, A **17** 365, 722, etc.].

The data are given in tables. The following is taken from the authors' summary : When injected into the haemocoele of the larvae, a dosage of 0·00275 mg. sodium arsenite gave 85–90 per cent. mortality in 4 hours ; and when introduced through the mouth into the digestive tract, 0·00425 mg. gave 75–80 per cent. mortality in the same time. When used in the latter manner, it was about 113 times as toxic and twice as rapid in action as acid lead arsenate, of which 0·24 mg. gave 26–33 per cent. mortality in 4 hours and 63–73 per cent. in 8.

Sublethal dosages of 0·00375 mg. sodium arsenite and 0·24 mg. acid lead arsenate gave, respectively, approximately the same mortality of larvae of all strains when injected into the alimentary canal. It appears, therefore, that the greater difficulty experienced in controlling larvae of *C. pomonella* in Colorado than in Missouri and Virginia is not due to their having developed a resistance to arsenic.

SHULL (W. E.). **An Investigation of the *Lygus* Species which are Pests of Beans (Hemiptera, Miridae).**—*Res. Bull. Idaho agric. Exp. Sta.* no. 11, 42 pp., 3 figs., 19 refs. Moscow, Idaho, May 1933. [Recd. February 1934.]

The immature stages of *Lygus elisus*, Van Duzee, and *L. hesperus*, Knight [*cf. R.A.E.*, A **22** 94], are briefly described. In field cages, a female of either species usually laid four eggs daily. They were deposited singly, on lucerne usually in the stems near the nodes and less frequently in the leaves, flowers or fruits, and on beans in the pods (especially those 1–2½ ins. long) just beneath the calyx and occasionally in the stems. The incubation period was 9 days, and the 5 nymphal instars totalled about 4 weeks. Sweepings over lucerne and clover in 1931 showed that there were four generations in southern Idaho. Adults of both species have been found in rubbish and protected places during the winter. Nymphs are scarce before 1st May, and do not appear in large numbers until late June. Notes are given on the injury caused to beans in cages. Most of the damage occurred when the pods were beginning to grow thinner, and before the fruit and seed coats began to toughen. The feeding of the Capsids on bean flowers caused them to fall before the fruits were set. A list is given of plants on which nymphs or adults of either species were found. *L. hesperus* apparently has a slightly wider range than *L. elisus*. The former was generally more numerous on lucerne and beans, and the latter at the edges of cultivated areas and in waste land. An increased infestation of beans was observed after the mowing of the second crop in adjacent lucerne fields. Injury by migrating bugs may be reduced by delaying this or by the cultivation of beans that mature early. In 1931, the maximum incidence of the four broods on lucerne occurred about 15th May, 6th June, 24th July and 18th August respectively.

Work and Progress of the Agricultural Experiment Station 1932. Entomology.—*Bull. Idaho agric. Exp. Sta.* no. 197 pp. 35–40. Moscow, Idaho, May 1933. [Recd. February 1934.]

Sprays containing 0·8 per cent. summer oil and 0·25 or 0·125 per cent. pyrethrum extract did not give a high percentage of control of the

codling moth [*Cydia pomonella*, L.] on apple. Five different sprays were tried against the San José scale [*Aspidiotus perniciosus*, Comst.] on apple, and good control was obtained with liquid lime-sulphur (5°Bé.) and 4 per cent. commercial oil emulsion. Crawlers maintained themselves on bark, sprayed three months previously, nearly as well as on unsprayed bark. Male pupae were found on 14th May, and a large percentage of adult males had emerged before 28th May. Crawlers first appeared in the laboratory on 16th June and in the field on 27th June. Females were still reproducing as late as 5th August.

Studies were continued on *Empoasca maligna*, Walsh, and *Typhlocyba pomaria*, McAtee, both of which injured apples, and the latter prunes also [*cf. R.A.E.*, A **19** 104]. Both species overwintered in the egg-stage [**20** 128, 137] under the bark of twigs or branches. The vitality of the tree and the quality of the fruit is lowered, and on heavily infested trees the fruit is spotted. Good control was given by a 0·8 per cent. oil spray, and nicotine sulphate, pyrethrum extract and two proprietary sprays were satisfactory. In experiments against the destructive pruneworm [*Mineola scitulella*, Hulst.], pyrethrum extract (0·25 per cent.) combined with a kerosene-soap emulsion or with a dormant oil (scale spray) gave 93 and 71 per cent. control respectively [*cf.* **20** 695]. Injury by this Pyralid in one district increased from 5 per cent. in 1931 to 9·5 in 1932. The silver mite [*Phyllocoptes*], which was first recorded in 1930, has become increasingly harmful to prune in south-western Idaho, injuring the leaves to such an extent during May and June that the size and quality of the fruit are impaired. Summer oil sprays seem to afford control.

Hibernating adults of the pea Bruchid [*Bruchus pisorum*, L.] were more numerous than in previous years ; some were found at the end of August, so that apparently a few individuals hibernate for two winters before becoming active. The maximum number of adults in flight occurred on 23rd September, and there was no indication that many were migrating towards distant wooded areas [*cf.* **22** 93, etc.]. Infestation rapidly increased in early June, and sweeping records showed that there was a migration from an early-planted field of peas to an adjacent late one in which the plants were in flower. In one field, there was a heavy infestation next to a brushwood fence. Well formed eggs were found in the ovaries of females on 31st May. The first egg was deposited on 8th June and hatched in 10 days. Development was studied by splitting open 500 peas from two fields at four-day intervals. In one field, the first pupae were found on 29th July and the first adult on 7th August, and the first adult emerged from a pea on 15th August. The pupal stage was approximately 12 days. In the other field, which had later-planted peas, the corresponding dates were 18th and 30th August and 19th September, and the pupal stage was approximately 16 days.

Slifer (E. H.). **Insect Development VI. The Behavior of Grasshopper Embryos in anisotonic, balanced Salt Solutions.**—*J. exp. Zool.* **67** no. 1 pp. 137–157, 7 figs., 15 refs. Philadelphia, 1934.

When placed in Ringer's solution of salts, isolated embryos of *Melanoplus differentialis*, Thos., were able to endure a great increase in the osmotic pressure of the surrounding medium. This ability must be of service when eggs are subjected to periods of extreme dryness, and is one of the factors affecting the abundance of grasshoppers.

Marshall (J.) & Groves (K.). **Non-lead Sprays for Codling Moth.**—*Proc. Wash. St. hort. Ass.* **29** (1933) pp. 39–60. Yakima, Wash. [1934.]

In this progress report of work carried out in Washington State during 1933, the control of the codling moth [*Cydia pomonella*, L.] on apple obtained from the application of a dormant spray of oil, a calyx spray of lead arsenate and six cover sprays of 3 lb. lead arsenate in 100 U.S. gals. water is compared with results obtained when numerous other materials, combined with oils, spreaders or substances to reduce arsenical injury, were substituted in the cover sprays.

The following is largely taken from the authors' summary of work in the field and the laboratory: Herring or dogfish oil (0·25 per cent.) in all the cover sprays gave commercial control of severe infestations of the two-spotted mite [*Tetranychus telarius*, L.]. A mixture of zinc arsenate (3 lb.) and herring oil gave results against *C. pomonella* apparently comparable to lead arsenate alone, and the residue was satisfactorily removed with sodium silicate. It caused injury (probably of an arsenical nature) to the foliage late in the season, which could possibly be avoided by the substitution of mineral oil for fish oil.

The addition of ferrous hydroxide (1 lb. ferrous sulphate: 2 lb. calcium hydroxide) to zinc arsenite (3 lb.) prevented injury, but reduced the efficiency of the arsenical. More satisfactory results could probably be obtained by lowering the iron content. An excess of iron interfered with the colouring of the fruit, which, together with the control of *C. pomonella*, was improved by the addition of herring oil. A special iron-coated zinc arsenite (containing 0·5 per cent. iron as ferric hydroxide) used with herring oil gave better control than lead arsenate and was no more injurious.

Manganese arsenate (3 lb.) with colloidal spreader or 0·25 per cent. dogfish or linseed oil was inferior to lead arsenate, but with 0·5 per cent. mineral oil it was almost as effective. It caused comparatively little injury with colloidal spreader, a considerable amount with mineral oil and even more with the other oils.

In several combinations calcium arsenate (3 lb.) was less effective than lead arsenate and caused more injury, but with 0·5 per cent. mineral oil it was more effective and little if at all more injurious. It was innocuous to the fruit and foliage when used with a metallic sulphate (1 lb.) combined with an excess (2 lb.) of lime (calcium hydroxide). With ferrous sulphate, it was less effective and the colouring of the fruit was not normal, but these defects were largely corrected by the addition of 2 lb. lignin pitch. With copper sulphate, it was more effective, but considerable russeting of the fruit resulted. With zinc or aluminium sulphate, it was apparently as effective as the lead arsenate and less injurious, and the residue is apparently easily removable with an acid wash. With a large excess of lime and 0·25 per cent. herring oil, it did not harm the plants but was ineffective. With herring oil alone, 7 brands all proved injurious.

Fish oil (0·25 per cent.) was approximately as effective with nicotine sulphate (1 : 1,200) as mineral oil, and this mixture may prove useful against the second brood, in view of the difficulty experienced in the removal of residue when nicotine sulphate and mineral oil has been applied after lead arsenate. Hydrated lime used alone in large quantities did not afford sufficient protection.

The results obtained with various proprietary materials are given. It is concluded that lead arsenate remains the most satisfactory single spray material for *C. pomonella*, and lead arsenate and fish oil the best combination.

Webster (R. L.) & Marshall (J.). **Deposit and Control.**—*Proc. Wash. St. hort. Ass.* **29** (1933) pp. 62–70, 3 figs. Yakima, Wash. [1934.]

Damage by the codling moth [*Cydia pomonella*, L.] was less severe in Washington in 1933 than in 1932, though the difficulty of treating fruit satisfactorily was increased by the new regulations regarding the tolerance of lead [*R.A.E.*, A **22** 183] and fluorine [**21** 78]. Percentages of 23 or more infested apples were sometimes found on trees that had received 6 cover sprays of 3 lb. lead arsenate in 100 U.S. gals. water. An average deposit of not less than 0·08 mg. arsenic per sq. in. fruit, which has been recommended, would result in the accumulation of 0·125 grains arsenic per lb. fruit if continued until harvest. In sprays of 2 lb. lead arsenate, the use of 1 U.S. pint fish oil instead of 1 U.S. quart [*cf.* **21** 318] decreased the deposit by about 10–15 per cent.

On trees sprayed with 3 lb. manganese arsenate and 1 U.S. quart dogfish oil, the percentage of infested fruit was higher (22·2 : 11·8) than on those sprayed with lead arsenate alone, and though the arsenical deposit was the same (0·127 mg. per sq. in.), it was much harder to remove. Calcium arsenate with mineral oil (2 U.S. quarts) gave good control and left a large deposit (0·156 mg.) that was easily removed with an acid wash ; with herring oil it also gave good control and a large deposit, but caused severe foliage injury and fruit drop late in the season [*cf.* preceding paper]. With 3 oz. soap, it left a large deposit and gave good coverage, but failed to protect the fruit.

It is pointed out that a formula giving a direct relation between deposit and control will not be applicable to all varieties of apple.

Overholser (E. L.), Overley (F. L.) & St. John (J. L.). **Some Observations concerning Spray Residue Removal in 1933.**—*Proc. Wash. St. hort. Ass.* **29** (1933) pp. 74–78. Yakima, Wash. [1934.]

Overley (F. L.), Overholser (E. L.) & St. John (J. L.). **1933 Washing Experiments with special Reference to new Sprays.**—*T. c.* pp. 79–85, 1 fig.

Experience in Washington in 1933 showed that apples may be satisfactorily protected from the codling moth [*Cydia pomonella*, L.] by the addition of fish oil to the lead arsenate sprays applied against the first brood, and effectively cleaned of both lead and arsenical residues by washing with sodium silicate [*cf. R.A.E.*, A **21** 318]. The requisites for a washing machine include underneath brushes, a forceful overhead-flood system of agitation and some means of dealing with the foam developed by the addition of soap [*cf.* **22** 184] (which, if excessive, may be reduced by small amounts of kerosene) and of thoroughly rinsing the fruit. An experimental type of apparatus is described. Recently harvested apples washed for 20–40 secs. at maximum temperatures of 100–110°F. were sometimes injured, whereas fruit on which wax had developed withstood temperatures of 110 or even 125°F. The sodium silicate solution may be used for a comparatively long period by allowing the sediment to settle and

siphoning off the liquid, to which more sodium silicate and fresh water may be added. In view of the risk of injury from accumulations of soluble arsenic, a thorough rinse with clean water is most important.

Hydrochloric acid was more satisfactory than sodium silicate for fruit sprayed with manganese or calcium arsenate or with lead arsenate and lime, and equally satisfactory for early harvested and early washed fruit sprayed with lead arsenate and mineral oil, but less satisfactory for fruit sprayed with lead arsenate and fish oil or, after wax had developed, for fruit sprayed with lead arsenate alone or combined with mineral oil. In successive washings of fruit sprayed with lead arsenate, it appears generally advisable to use the acid first. The use of combinations containing mineral oil against the second brood following sprays of lead arsenate hinders residue removal. The use of spreaders of the soap type appears to facilitate it.

Smith (Edwin) and others. **The Removal of Lead, Arsenic and Fluorine Residues from Apples.**—*Proc. Wash. St. hort. Ass.* **29** (1933) pp. 86–96, 1 fig. Yakima, Wash. [1934.]

An account is given of experiments undertaken with the object of adapting the treatment current in the Pacific Northwest for the removal of residues of arsenic from apples to include those of lead and fluorine. Apples of one variety susceptible to injury and another (commonly grown) difficult to clean were treated 10 days after harvest according to methods that had previously shown promise, and were subsequently placed in cold storage. The materials in the solvent solutions were used at the highest temperature and concentration practicable. The data, which are tabulated in detail, permit comparisons of the relative extent of removal of lead, fluorine and arsenic residues as influenced by the schedule used, the type of washing machine employed and the washing solution selected.

Martin (C. H.). **Notes on the Larval Feeding Habits and the Life-history of** *Eumerus tuberculatus* **Rondani.**—*Bull. Brooklyn ent. Soc.* **29** no. 1 pp. 27–38, 2 pls., 3 refs. Lancaster, Pa, February 1934.

In investigations in Long Island during July–September 1929, adults of *Eumerus tuberculatus*, Rond. [*cf. R.A.E.*, A **21** 344] were confined in field cages, fed on undiluted honey and supplied with discarded narcissus bulbs. Only a few eggs were laid, singly or in clusters of up to 40, either at the neck of the bulbs, under the shrivelled skin, or in crevices in the cork tissue at the basal end. In the field, most of the eggs were found 1–2 inches beneath the surface of the soil, but a few on the surface. Females were observed ovipositing in the soil several feet from the nearest bulb. In test tubes the sides of which were kept moist, the incubation period lasted 2–9 days at temperatures ranging from 64·7 to 72·1°F.

Full-grown larvae on dormant bulbs were always found in decayed tissue. Newly hatched larvae, confined on dormant bulbs by means of bone rings $\frac{1}{8}$ inch thick stuck on with paraffin wax and covered with cover glasses, were not able to penetrate the unbroken epidermis of either healthy or decayed bulbs, but they were able to enter tissue that had been soaked and broken. When they were placed on healthy tissue, development did not begin until decay set in. Larvae placed

on healthy and on decayed tissue developed in about 27 and 22 days respectively at 72·5°F. The pupal stage lasted 8–14 days at 65·8–70·3°F. Adults emerged between 8 a.m. and noon, with the peak between 9 and 10 a.m.

BLANCHARD (R. A.). **Control of Aphids on Alfalfa in the Antelope Valley, Calif.**—*Circ. U.S. Dep. Agric.* no. 307, 6 pp. Washington, D.C., January 1934.

The seasonal history of *Macrosiphum onobrychis*, Boy. (*Illinoia pisi*, Kalt.) on lucerne in California is outlined [*cf. R.A.E.*, A **13** 27]. Observations over five years show that injury is most severe in seasons with a late spring, when the Aphids develop more rapidly than the lucerne. They multiplied more rapidly on light sandy soils than on loamy ones, probably because the former warm up more quickly, thus stimulating the growth of the lucerne. The control measures discussed include pasturing and cultivation, early irrigation, early cutting, the application of granular calcium cyanide (22–25 lb. per acre), and the use of machines for burning over the lucerne [**14** 653; **20** 409; **22** 106].

Aphis medicaginis, Koch, is also sometimes numerous on lucerne, but not sufficiently to cause economic loss.

PIERCE (W. H.). **Viroses of the Bean.**—*Phytopathology* **24** no. 2 pp. 87–115, 5 figs., 38 refs. Lancaster, Pa, February 1934.

In the course of investigations on the resistance of varieties of bean (*Phaseolus vulgaris*) to the virus of common bean mosaic, previous records [*R.A.E.*, A **11** 145; **21** 168] of its transmission by *Macrosiphum solanifolii*, Ashm., and *M. onobrychis*, Boy. (*Illinoia pisi*, Kalt.) were confirmed. A virus distinguished as yellow bean-mosaic was also transmitted by both Aphids, and alfalfa mosaic (obtained by inoculation from lucerne) by *M. onobrychis*. These three viruses were capable of infecting a wide range of leguminous plants, and the last-named also some solanaceous ones. Beans also proved susceptible to tobacco mosaic and tobacco ring-spot virus.

MACDANIELS (L. H.) & BURRELL (A. B.). **The Effect of Sulphur Fungicides, applied during the Bloom, on the Set of Apple Fruits.**—*Phytopathology* **24** no. 2 pp. 144–150, 2 refs. Lancaster, Pa, February 1934.

From further studies [*cf. R.A.E.*, A **18** 493], it appears certain that sulphur applied either before or shortly after pollination reduces the set of apples. The reduction was more marked when the sulphur was applied early in the blossoming season, and probably also when it was applied in a lime-sulphur spray rather than as a dust.

FRIEND (R. B.) & WILFORD (B. H.). **The Spruce Gall Aphid as a Forest Pest.**—*J. For.* **31** no. 7 pp. 816–825, 10 refs. Washington, D.C., November 1933. [Recd. March 1934.]

Observations in plantations of white and Norway spruce (*Picea glauca* and *P. excelsa*), chiefly the latter, in Connecticut and Pennsylvania suggest that the importance of *Chermes* (*Adelges*) *abietis*, L.

(spruce gall aphis) as a forest pest has been overestimated. Its life-history [*cf. R.A.E.*, A **15** 498, etc.] is briefly described. Winged females were apparently carried by wind as much as two miles. In a stand of *P. glauca*, however, the number of infested trees only increased from 5 in 1927 to 47 in 1929. Galls that completely encircle a twig [*cf.* **15** 189] and so destroy it are apparently formed only when the offspring of more than one stem-mother are present. Owing to the heavy mortality of the overwintering forms, this rarely happens. In infested stands, only about 25 per cent. of the trees were appreciably injured, and they were generally those of slow growth, which would normally have become suppressed. About 33 per cent. of the trees were immune, owing to the failure of the overwintering forms to survive on them, and others were very lightly infested [*cf.* **21** 234]. In favourable situations, trees that are not immune will generally outgrow the effects of injury, the crowns remaining free from galls and the longitudinal growth not being visibly impaired.

A 1 per cent. spray of a light miscible oil (containing 65 per cent. mineral oil with an unsulphonatable fraction of 72 per cent. and a viscosity of 65–75 seconds Saybolt), tested in a Tattersfield apparatus [**12** 225] at 73°F. and 17 per cent. relative humidity, killed all the Aphids present. Almost complete control was obtained in a field experiment in April with a 0·5 per cent. spray, and the needles were not injured [*cf.* **19** 480 ; **21** 316] even by sprays containing 2 per cent. oil. Trees should be sprayed between the middle of March and the middle of April, as the Aphids are later protected by their waxy secretion. The tips of the branches should be thoroughly sprayed, and treatment should be repeated in following years. The development of immune strains of *P. excelsa* appears possible.

Benjamin (F. H.). **Descriptions of some native Trypetid Flies with Notes on their Habits.**—*Tech. Bull. U.S. Dep. Agric.* no. 401, 95 pp., 44 figs., 100 refs. Washington, D.C., January 1934.

Brief descriptions are given of 34 Trypetids, including 7 new species, collected in Florida, chiefly from composite plants, together with notes on the characters used in classification and a key to the genera and subgenera represented. *Zonosemata*, gen. n., is erected for *Spilographa* (*Zonosema*) *electa*, Say, and *S.* (*Z.*) *vittigera*, Coq., which occurs in Texas and may be only a biological race of it. *Zonosema* is considered by Hendel to be a synonym of *Rhagoletis*. *R. cingulata*, Lw., was reared from *Prunus serotina* [*cf. R.A.E.*, A **21** 603, etc.], *Chionanthus virginica* and *Osmanthus americana* ; *R. pomonella*, Walsh, from apple, hawthorn (*Crataegus*), *Cornus florida*, *Prunus umbellata*, *P. angustifolia* and *Aronia arbutifolia* in the northern half of the State ; *Toxotrypana curvicauda*, Gerst., from papaya ; and *Zonosemata electa* in large numbers from wild species of *Solanum*. The last-named has also been obtained from the fruit of an egg-plant (*S. melongena*) intercepted in quarantine and from tomatos, twice in Florida and once in Georgia.

Service and Regulatory Announcements, July–September 1933.—*U.S. Dep. Agric.* B.P.Q., S.R.A. no. 116, pp. 197–243. Washington, D.C., December 1933.

In addition to official announcements in connection with quarantines against insect pests in the United States, many of which have already

been noticed, plant quarantine restrictions issued by New Zealand, Jamaica, Greece, Germany and British Honduras are quoted or summarised.

A summary is given of the results obtained in a fruit-fly survey carried out in 1931–1932 in the West Indies and South America by Kisliuk and Cooley, a more detailed account of which in respect of the British West Indies has already been noticed [*R.A.E.*, A **21** 429]. No fruit-flies were found in Antigua, Barbados or St. Vincent. Other pests included: *Aleurocanthus woglumi*, Ashby, and the weevil, *Pachnaeus* (?) *psittacus*, Ol., on *Citrus*, *Coccus hesperidum*, L., and *C. viridis*, Green, on guava, *Nezara viridula*, L., on okra [*Hibiscus esculentus*], *Heliothis obsoleta*, F., and *Phthia picta*, Drury, on maize, *H. obsoleta* and *Fundella* sp. on pigeon peas [*Cajanus indicus*], *Aspidiotus lataniae*, Sign., on sapodilla [*Achras sapota*], and *Murgantia histrionica*, Hahn, and *Plutella maculipennis*, Curt., on cabbage, in the Bahamas; *Aleurocanthus woglumi* and *Pseudoparlatoria* sp. on Surinam cherry [*Eugenia uniflora*] and the former also on *Citrus*, *Prepodes vittatus*, L., and *Pachnaeus citri*, Mshl., which were particularly injurious to *Citrus*, the Eurytomid, *Bephrata cubensis*, Ashm., in seeds of custard-apple [*Anona*], the Cassidid, *Stoiba swartzi*, Boh., on sweet potato, *Lachnopus aurifer*, Drury, on mango, *Crotalaria* and other plants, *Platyedra* (*Pectinophora*) *gossypiella*, Saund., and *Dysdercus andreae*, L., on cotton, *Trialeurodes variabilis*, Quaint., on papaya, *Pycnoderes quadrimaculatus*, Guér., on melon, okra and many other plants, and *Vinsonia stellifera*, Westw., *Coccus acuminatus*, Sign., and *C. mangiferae*, Green, on rose-apple [*Eugenia jambos*], in Jamaica; *Oeceticus* (*Oiketicus*) sp. on pomegranate in Nevis; the Bruchid, *Pachymerus* (*Caryedon*) *fuscus*, Goeze, and *Corcyra cephalonica*, Stn., in tamarind pods, the Coreid, *Leptoglossus stigma*, Hbst., on guava, *N. viridula* on leguminous plants and cotton, and *P. gossypiella* and *Alabama argillacea*, Hb., on cotton, in St. Kitts; *D. andreae* on mango and *Pulvinaria psidii*, Mask., on yellow hog-plum [*Spondias mombin*] in Antigua; *L. stigma* on *S. mombin* in St. Lucia; *Platynota rostrana*, Wlk., *Diaprepes abbreviatus*, L., and *Lachnopus* sp. attacking *Citrus*, and *Bephrata maculicollis*, Cam., in seeds of soursop [*Anona muricata*], in Dominica; *Calandra* (*Sitophilus*) *linearis*, Hbst., in tamarind seeds, *D. abbreviatus* on cassava, and *Aspidiotus* (*Targionia*) *harti*, Ckll., on yam, in Barbados; *Xyleborus sacchari*, Hopk., in seeds of angelin [*Andira*], *Lepidosaphes alba*, Ckll., on cassava, *Leptoglossus vexillatus*, Stål, on guava, *A. harti* on yam, and *N. viridula* on okra, in St. Vincent; and *B. maculicollis* and *Stenoma* spp. in cherimoyas [*Anona cherimolia*], a weevil, *Lydamis* sp., on *A. montana*, *Stenoma* sp. in guavas, *Inga setifera* and *I. ingoides*, *Cicadella laudata*, Wlk., on *Cordia cylindristachya*, cotton and grapefruit, *Ceuthorrhynchus* sp. and *Anthonomus* (?) *eugenii*, Cano, in *Eugenia* sp., *Leptoglossus gonagra*, F., on guava and *I. ingoides*, *L. stigma* on guava, *Steirastoma breve*, Sulz., on okra, *Ancylostomia* (?) *stercorea*, Zell., on pigeon pea, and *Tomaspis saccharina*, Dist., on sugar-cane and various grasses, in Trinidad.

Larvae of *Anastrepha* were found in Haiti, Santo Domingo, Guadeloupe, St. Croix and Martinique, feeding on *Spondias* spp., mango, guava, passion fruit [*Passiflora*], *E. jambos* and Chile plums. The adult Trypetids found were: *A. acidusa*, Wlk. [*cf.* **22** 26] in all these Islands; *A. suspensa*, Lw., in Haiti and Santo Domingo; and *A. integra*, Lw., *Acrotaenia* spp., *Toxotrypana curvicauda*, Gerst., and

Blepharoneura fulvicollis, Wulp, in Santo Domingo. Larvae of *T. curvicauda* were found in papayas in Haiti. Other insects included: *Bephrata cubensis* in seeds of *Anona muricata*, *Stenoma* (*Mothonica*) *ocellea*, Forbes, in genips [*Melicocca bijuga*], *N. viridula* and *Acrosternum marginatum*, P. de B., on beans, and *Leptoglossus gonagra* and *L. stigma* on guava, in Haiti; *L. stigma* on bitter almond, *L. gonagra* and *Dysdercus andreae* on cacao, and *Diaprepes abbreviatus* and *Lachnopus* sp. on *Spondias mombin*, in Santo Domingo; *Phthia picta* on tomato, *Xyleborus confusus*, Eichh., in guava, *Trachyderes succinctus*, L., on guava and mango, and *Diabrotica ochreata*, F., on *S. mombin*, in Guadeloupe; *D. fucata*, F., on guava and mango in Martinique; *P. gossypiella* on okra in St. John; *Lachnopus curvipes*, F., on mango in St. Thomas; and *Vinsonia stellifera* and *Coccus mangiferae* on mango, and *Metamasius hemipterus*, L. (West Indian cane weevil) on sapodilla, in St. Croix.

Larvae of *Anastrepha* were found in Brazil, the survey of which is recorded under the separate States visited, in golden apple [? *Spondias dulcis*], apple, grumichama [*Eugenia brasiliensis*], jaboticaba [*Myrcia jaboticaba*], pear, peach, *E. uniflora*, sapodilla, pomerack, guava and sour orange. Trypetid larvae were also found in navel oranges, Barbados cherry [*Malpighia*], kei apple [*Aberia caffra*], plum and quince. Larvae of *Ceratitis capitata*, Wied., were found in the State of Rio and the Federal District of Rio de Janeiro in *Citrus* fruits, peaches, and star-apples [*Chrysophyllum cainito*], in São Paulo in coffee berries, sapodillas and peaches, and in Minas Geraes in plums, grapefruit and kumquat [*Fortunella margarita*]. The adult Trypetids taken were: *Anastrepha grandis*, Macq., *A. distans*, Hendel, *A. serpentina*, Wied., *A. peruviana*, Tns., *A. daciformis*, Bezzi, *A. parallela*, Wied., *A. fraterculus*, Wied., *Hexachaeta eximia*, Wied., *Euaresta mexicana*, Wied., *Acrotaenia latipennis*, Wied., *Tomoplagia* sp., *T. rudolphi*, Lutz & Costa Lima, *Ensina peregrina*, Lw., *Xanthaciura insecta*, Lw., and *C. capitata*. *Anastrepha consobrina*, Lw., was reared from *Passiflora edulis* [*cf.* **18** 494] and *A. grandis* from guavas and oranges in São Paulo. Other insects found in Brazil include: *P. gossypiella* on cotton; *Phthorimaea* (*Gnorimoschema*) *operculella*, Zell., on egg-plant [*Solanum melongena*]; *Gymnandrosoma aurantium*, Costa Lima, *Coccus perlatus*, Ckll., *Pinnaspis* (*Hemichionaspis*) *aspidistrae*, Sign., *Melipona* (*Trigona*) *ruficrus*, Latr., *Aleurothrixus floccosus*, Mask., *Lepidosaphes beckii*, Newm., and *Pseudaonidia trilobitiformis*, Green, on *Citrus*; *Dysdercus peruvianus*, Guér., on plum; *Stephanoderes hampei*, Ferr., in coffee berries; and *Ceroplastes grandis*, Hemp., on persimmon.

Larvae of *Anastrepha* were found in Uruguay [**22** 65] in peaches, plums and apricots, and *Ceratitis capitata* was reared from oranges and peaches. Adults of *Paracantha culta*, Wied., *Camaromyia* sp., *Tephritis lindigi*, Hendel, and *Pterotaenia fasciata*, Wied., were also taken.

Larvae of *Anastrepha* were taken in northern Chile in mangos, peaches and pears, and adults of *A. peruviana* on the foliage of these and many other plants. Other adults taken were *Camaromyia bullans*, Wied., *Tomoplagia unifascia*, Hendel, and *Tephritis fucata*, F., in northern Chile, *C. bullans*, *Trypanea abstersa*, Lw., and *Pterotaenia fasciata* in central Chile, and *Rhagoletis ochraspis*, Wied., in southern Chile. Other injurious insects taken in central Chile included: *Epicauta pilmus*, Molina, on peach, lucerne and potato; *Pantomorus godmani*, Crotch, on lucerne, *Anona cherimolia*, cherry, grape, peach, strawberry and potato; *Cydia* (*Carpocapsa*) *pomonella*, L., in apples, apricots,

nectarines, pears, peaches, quinces and walnuts; the weevils, *Rhyephenes humeralis*, Guér., on avocado, and *Lophotus phaleratus*, Erichs., on *Lucuma* sp.; *Plutella maculipennis*, on cabbage; *Caliroa* (*Eriocampoides*) *limacina*, Retz., on cherry and pear; *Leptoglossus chilensis*, Spin., on fig, nectarine, peach and plum; *Scolytus rugulosus*, Ratz., on medlar and peach; *Heliothrips haemorrhoidalis*, Bch., on persimmon; and *Phthorimaea melanoplintha*, Meyr. (*Gnorimoschema tuberosella*, Busck), *P. operculella* and *Heliothis obsoleta* on potato.

In Peru [*cf.* **21** 83; **22** 146], larvae of *Anastrepha* were taken in apples, *Malpighia*, *Anona*, cherimolias, guavas, cattleya guavas [*Psidium cattleianum*], purple hog-plums [*Spondias purpurea*], *Inga feuillei*, loquats [*Eriobotrya japonica*], *Lucuma* sp., mangos, olives, palillos [*Campomanesia lineatifolia*], peaches, pears, pomegranates, *Eugenia jambos* and quinces. *A. serpentina* was reared from *Lucuma*, and adults of *A. distans* and *A. peruviana* were taken on a number of food-plants. *Rhagoletis ochraspis* was taken on potato and in tomatos, and adults of *Pterotaenia fasciata* on potato. Other insects included *C. pomonella* in peaches, apples and quinces; *Heliothrips haemorrhoidalis* on pear; *Euscepes batatae*, Waterh., on sweet potato; and *Phthorimaea* (*G.*) *lycopersicella*, Busck, in tomatos.

Atwood (C. E.). **The Genera *Halictus* and *Andrena* in western Nova Scotia.**—*Canad. J. Res.* **10** no. 2 pp. 199–220, 91 figs., 11 refs. Ottawa, February 1934.

This paper deals chiefly with the classification of the species of *Halictus* and *Andrena* collected in the course of an investigation in a district in Nova Scotia during 1928–32 on the pollination of apple, of which these bees proved to be the chief agents [*R.A.E.*, A **22** 35].

French (C.). **New Records of Plants attacked by Native Insects. No. 11: "The Yellowcross," "Crusader," or "Holy Bug," *Mictis profana*, Fabr.**—*Vict. Nat.* **50** no. 10 p. 218. Melbourne, February 1934.

In this further note of a series [*cf. R.A.E.*, A **22** 139], information is given on *Mictis profana*, F., a Coreid that is found in Victoria on the shoots of young gum trees, especially *Eucalyptus viminalis*, and has recently become a pest of *Citrus* and cultivated wattles [*Acacia*], killing the shoots by sucking the sap [*cf.* **22** 82].

Entomological Investigations.—*Rep. Coun. sci. industr. Res. Aust.* **7** (1932–33) pp. 26–31. Canberra, 1933. [Recd. March 1934.]

During 1932–33, further consignments of *Chrysomela brunsvicensis*, Grav., *C. hyperici*, Forst., and *C. varians*, Schaller [*cf. R.A.E.*, A **20** 612] were received in Australia from the laboratory of the Imperial Institute of Entomology. About 10,000 adults of *C. varians* were liberated in Victoria in areas infested with St. John's wort (*Hypericum perforatum*); those previously liberated appear to have died out, except in one locality, where all stages were found in November 1932. *Lathronympha hypericana*, Hb., *Depressaria hypericella*, Hb., *Aphis chloris*, Koch, and *Anaitis* spp. [*loc. cit.*] were also sent to Australia after they had been found in extensive tests not to attack plants of economic importance. Large numbers of *Anaitis* bred in the insectary at Canberra did not feed on any of about 30 economic plants. Over

1,000 adults of *Euaresta aequalis*, Lw., were liberated in Queensland in 1933, and pairing and oviposition have been observed on green leaves of Noogoora burr (*Xanthium pungens*) [*cf.* **20** 544]. Consignments of this Trypetid have been obtained from America in burrs and of the weevil, *Cylindrocopturus adspersus*, Lec., in dry stems [*cf.* **11** 209] of *Xanthium*. About 200 eggs of *Tyria jacobaeae*, L. [*cf.* **19** 234] were colonised on ragwort (*Senecio jacobaea*) in Victoria in November. Puparia of *Hylemyia* (*Pegohylemyia*) *seneciella*, Meade, were received from New Zealand in January 1933, and most of them have been placed in a refrigerator, so that adults may emerge at the time the weed flowers.

Liberations were made in several new areas of the predacious mite, *Biscirus lapidarius*, Kramer, which had spread in the district in Western Australia where it was originally found [**21** 408] and was discovered in other localities in the south-west, where it had reduced the lucerne springtail, *Smynthurus viridis*, L., to negligible proportions. One strain of red clover [*Trifolium pratense*] was found to be resistant to this springtail and to *Halotydeus destructor*, Jack. As Tachinids of the genus *Protohystricia* parasitise *Porina* spp. in New Zealand, about 300 adults of the two commonest species were introduced against *Oncopera* [*cf.* **20** 165]. They attacked the larvae provided that the skin was sufficiently soft. Liberations were made in Victoria. An attempt to keep the puparia in cold storage so that the flies might attack the Tasmanian species of *Oncopera* was unsuccessful.

A survey of several plantations in the Canberra district showed that *Pinus radiata* begins to be attacked by *Chermes* [*pini*, L. (*cf.* **20** 166)] in the third or fourth year and is most susceptible in the sixth and seventh, after which it becomes free from infestation. A few individuals of *Leucopis obscura*, Hal., were recovered on twigs on which liberations had been made in May 1932, but its establishment is considered doubtful. Several consignments of this predator and of another Agromyzid, *Lipoleucopis praecox*, de Meij., were received from England; many died in transit, but the remaining flies were liberated in plantations in the Federal Capital Territory and New South Wales.

In Tasmania, 4,000 individuals of *Habrolepis dalmani*, Westw., from New Zealand were liberated against *Asterolecanium variolosum*, Ratz. (oak scale), and an unsuccessful attempt was made in January to introduce *Encarsia formosa*, Gah., in *Trialeurodes vaporariorum*, Westw. (greenhouse whitefly) from England.

The Tineid, *Stathmopoda melanochra*, Meyr., sent from Australia in April 1932 [*cf.* **21** 349], has apparently completed a generation in New Zealand, and it is probable that this natural enemy of the eucalyptus scale, *Eriococcus*, will be established within a few years. Cocoons of *Meteorus* sp., an Ichneumonid parasite of *Paropsis* [*dilatata*, Er. (*cf.* **19** 221)], have also been sent to New Zealand. It is reported that *Anaphoidea nitens*, Gir., sent to South Africa against *Gonipterus* [*scutellatus*, Gir.] (eucalyptus weevil) [**20** 269] has become established in the districts of higher rainfall.

Reports received from Experiment Stations 1932–1933.—Med. 8vo, xi+234 pp., ill. London, Empire Cotton Growing Corp., 1934. Price 2*s.* 6*d.*

In these reports, the cotton pests that have occurred at or near the various Experiment Stations are discussed as in previous years [*cf. R.A.E.*, A **21** 156, etc.].

W. G. Wells, L. M. Hodge and W. A. R. Cowdry of the Biloela Station, Queensland (pp. 26–29) record a serious outbreak of *Euxoa radians*, Gn. [*cf.* **22** 138]. Damage by *Earias huegeli*, Rogenh., has increased progressively during the past three seasons [*cf.* **21** 185]; *Melhania abyssinica* was found to be a winter food-plant. Some injury was caused by *Crocidosema plebeiana*, Zell. *Heliothis obsoleta*, F., caused severe damage to commercial crops where pigweed (*Portulaca oleracea*) grew abundantly near the cotton. Nearly all the fields seriously affected by pink bollworms were within half a mile of cotton left standing from the previous season. The heavy infestation of these plants appeared to have originated on *Hibiscus divaricatus* in adjacent sections of scrub, and as seed cotton in the ginneries is effectively treated by heat, it seems possible that the pink bollworm may be indigenous to the scrub, which is connected along a chain of hills with the coastal areas from which the indigenous pink bollworm of Queensland, *Platyedra scutigera*, Hold., has been reported [*cf.* **14** 459; **18** 299]. Although *Aulacosternum nigrorubrum*, Dall. (false stainer) and *Tectocoris lineola*, F., appeared to be less numerous than usual [*cf.* **18** 296], a high percentage of stained cotton was reported from the district ginnery, which was probably largely due to the attacks of *Dysdercus sidae*, Montr., and *Oxycarenus luctuosus*, Montr.

F. S. Parsons and G. C. Ullyett (pp. 100–111) report the results of continuous observations at Barberton, Transvaal, on the seasonal fluctuations in infestation by *H. obsoleta* and the red bollworm [*Diparopsis castanea*, Hmps.] and parasitism of their eggs and larvae and on their relation to different food-plants. Co-ordinated investigations were inaugurated in Natal, Swaziland, and Northern and Southern Rhodesia. The eggs of both species were unevenly distributed over crops according to certain conditions of plant growth. Oviposition by *H. obsoleta* was largely restricted to the period of production of buds and flowers. On maize, large numbers of eggs began to be laid when the first staminate flowers appeared, and the peak of oviposition was past before the pistillate ones were abundant; at Barberton, oviposition on maize lasted for 2–3 weeks only. It was often observed that, where maize was in tassel, *H. obsoleta* laid few if any eggs on adjacent cotton, even though it was fruiting freely, and the possibility of utilising this fact to divert the moths from cotton is being investigated. Surveys indicated that fewer larvae survive on maize than on cotton. Sunflowers, ground-nuts and beans may also be of value as attractant crops. During the winter, *H. obsoleta* bred extensively on irrigated vegetable crops, particularly a month or two before the appearance of rain-grown cotton and maize. A high percentage of larvae survived, owing to the scarcity of natural enemies. It also bred on *Citrus*, and if these trees should blossom late in a season favourable to early development of rain-grown crops, they might be a source of very severe infestation of cotton. *Sturmia inconspicua*, Mg., the only indigenous larval parasite of importance [*cf.* **21** 157] does not attack young larvae. Those parasitised by *Microbracon brevicornis*, Wesm. [*cf.* **22** 81] in the field generally decompose too rapidly (under the conditions of high humidity and temperature obtaining during the summer months) to permit the development of parasite larvae. The liberation of large numbers of *Trichogramma luteum*, Gir., sometimes produced a fairly high rate of parasitism of the eggs of *H. obsoleta* on maize, but only a low one on cotton, and the rapid dispersal of the parasites prevented any benefit being obtained from their mass activity at any particular point. Breeding and liberation

of the Barberton strains of *Trichogramma* are therefore to be discontinued. A strain from Rhodesia that appears to be more satisfactory is now being reared and released in irrigated vegetable crops.

On trap-crops of ratoon or stand-over cotton, adults of *D. castanea* sometimes emerged as late as January, when the trap-crop had ceased to be attractive and plant cotton was in bud. Moreover, a higher percentage of the larvae survived than of the brood that overwintered in the pupal stage. The use of these trap-crops is not therefore advocated. As emergence from overwintered pupae is practically complete by the end of December, oviposition by this generation may be largely avoided, in the absence of ratoons, by planting cotton late.

In investigations on *Dysdercus* spp. reported on by E. O. Pearson (pp. 111–117), a uniform system of recording populations in various districts in South Africa was employed in 1933. In the absence of ratoon or stand-over cotton, the stainers appear in plant cotton at the end of February or the beginning of March, the migration reaching its peak about a month later. *D. nigrofasciatus*, Stål, appears earlier than *D. fasciatus*, Sign., or *D. intermedius*, Dist. In 1933, *D. fasciatus* was scarce except at points adjacent to ratoon or stand-over cotton. The stainer population apparently varied with the amount of cover available rather than the amount of crop matured. Normally all three species complete two and a partial third generation on cotton. At the end of the season, large numbers of the bugs have been successfully destroyed by stacking and burning the cut cotton plants and ploughing the land as soon as possible afterwards [*cf.* **21** 157]. Trapping on seed heaps [*cf.* **20** 243] was effective and might be used where cotton is being ratooned or allowed to stand over. The wild food-plants and the distribution of the more important ones are discussed in connection with the seasonal fluctuations of the stainers on cotton. All three species of *Dysdercus* have been shown to be capable of transmitting *Nematospora gossypii*. Staining that occurs in their absence was correlated with the presence of other bugs, particularly *Piezodorus purus*, Stål, and is apparently caused by the entry through insect punctures of bacterial infection present on the surface of the boll.

The work at Magut, Natal, is discussed by P. A. Bowmaker (pp. 123–125). The planting of small areas of maize as often as rainfall conditions permitted (as a precaution against adverse weather) is believed to account for the practical absence of oviposition by *H. obsoleta* on cotton during 1932–33. The measures previously recommended against *Syagrus rugifrons*, Baly [**19** 293] have proved satisfactory, although a second dusting is nearly always necessary because this Eumolpid feeds on the youngest parts of the trap-plants, chiefly at the season (mid-December to mid-January) when growth is most rapid.

J. E. Peat, reporting on the work at Gatooma, Southern Rhodesia (pp. 152–156), points out that with the Rhodesian strain or strains of *Trichogramma luteum* comparatively high rates of natural parasitism are obtained from *H. obsoleta* on both cotton and maize. Records of the time and duration of oviposition of this bollworm on crops other than cotton confirm Parsons' results that egg-laying occurs over a particular period (usually the pre-flowering and flowering period) of each crop. Eggs were laid on *Citrus* when the trees were flowering and on winter crops (wheat and oats) when these were coming into ear.

The results of work at Mazabuka, Northern Rhodesia, are summarised by A. G. Bebbington and W. Allan (pp. 159–161). Flying

swarms of *Nomadacris septemfasciata*, Serv., were active during May–July, but crops were successfully defended by smoke screens and the use of flags and tins. As *Dysdercus superstitiosus*, F., which severely attacked cotton during March, disappeared in early April and *D. fasciatus* did not occur on cotton until the latter part of June, after two pickings had already been taken, the greater part of the crop escaped damage by stainers. *D. intermedius* appeared in small numbers only. On *Thespesia rogersi* [*cf.* **21** 158], *D. superstitiosus* was abundant, as in previous seasons, at the time of flowering, but the numbers of *D. fasciatus*, which usually decrease during March and April when the bugs are migrating to cotton, remained high until the beginning of June ; the records of the fruiting and flowering of *Thespesia* appear to offer a ready explanation of these fluctuations in seasonal incidence. The cotton plants most heavily infested and most seriously damaged by *Dysdercus* were the larger ones growing on the heavier soil [*cf.* **21** 158].

In Uganda (G. W. Nye and H. R. Hosking, p. 178) the most serious pests were *Helopeltis bergrothi*, Reut., and *Lygus vosseleri*, Popp. [*cf.* **21** 302], and in St. Vincent, West Indies (S. H. Evelyn and S. C. Harland, p. 229) damage from pests during 1930–33 was negligible.

PAILLOT (A.). **Un nouveau type de maladie à ultravirus chez les insectes.**—*C. R. Acad. Sci.* **198** no. 2 pp. 204–205, 1 ref. Paris, 1934.

A larva of *Euxoa* (*Agrotis*) *segetum*, Schiff., collected near Lyons was found to be attacked by a new disease of a type not yet described from invertebrates. Although it resembled pseudo-grasserie of Pierids [*R.A.E.*, A **14** 150] in its symptoms and in its marked affinity for adipose cells, its cellular reactions were essentially different. Attempts to infect *per os* or *per cutem* were unsuccessful, whereas pseudo-grasserie of Pierids is easily transmissible *per os*.

MAUBLANC (A.) & ROGER (—). **La phthiriose du caféier.**—*C. R. Acad. Sci.* **198** no. 4 pp. 391–392. Paris, 1934.

In Kamerun, serious loss is caused by a disease of the roots of coffee identical with that attributed in Uganda and Kenya to *Polyporus coffeae*, which closely resembles *Bornetina corium*, causing a disease of vines in Palestine [*cf. R.A.E.*, A **5** 376 ; **7** 519]. In both cases, primary infection is due to Coccids, the fungus being a saprophyte living on the sweet secretion of the insects or on that oozing from the roots they attack.

DEL GIUDICE (E.). **Primo contributo alla conoscenza di un nuovo parassita del frumento** (*Haplothrips* **spec.**).—*Pubbl. Sta. sper. Granicol. B. Mussolini Sic.-Catania* no. 4 pp. 5–11, 4 figs. Catania 1933. (Abstr. in *Bibliogr. ital.* (A bis) **6** no. 12 p. 306. Rome, 1933.)

Morphological and biological notes are given on an unidentified species of *Haplothrips* infesting wheat in Sicily.

Monastero (S.). **Osservazioni preliminari ed esperimenti di lotta contro la** *Ceratitis capitata* **(Wied.) in provincia di Palermo.**—*G. Sci. nat. econ.* **37** mem. no. 2 pp. 1–11. Palermo, 1933. (Abstr. in *Bibliogr. ital.* (A bis) **6** no. 12 p. 306. Rome, 1933.)

The causes of the differences in infestation by *Ceratitis capitata*, Wied., in the Province of Palermo in 1931 and 1932 are discussed. The water in which wheat bran had fermented was found to be a more attractive bait than vinegar [*cf. R.A.E.*, A **19** 276].

Paoli (G.). **Sulla** *Triecphora*. **Note di biologia e mezzi di lotta.** [On *Tomaspis sanguinolenta*. Biological Notes and Control Measures.] —*Pagine agric.* 1933 no. 5 reprint 8 pp., 2 figs. Leghorn, May 1933.

Observations on the biology of *Tomaspis* (*Triecphora*) *sanguinolenta*, Scop. (*mactata*, Germ.) were made in 1933 near Leghorn, as this Cercopid had again appeared in abundance on vines, etc. [*cf. R.A.E.*, A **21** 434]. The nymphs live 4–6 inches underground in cracks and in tunnels made by worms, etc., sucking the roots of herbaceous plants and secreting masses of froth. The adults emerge from the soil from mid-April to mid-May. They feed on the stems and leaves of herbaceous plants and on the new growth of woody ones such as vines, the shoots of which become stunted. The nymphs should be crushed when the froth-masses are turned up. The adults are easily caught in collecting-nets of strong material, but to avoid injury to the tender shoots, vines should be carefully jarred and the froghoppers collected from the ground. Poultry devour them eagerly.

Trinchieri (G.). **Intorno alla presente diffusione d'***Aspidiotus perniciosus* **in Europa.** [Concerning the present Distribution of *A. perniciosus* in Europe.]—*Boll. Soc. ent. ital.* **66** no. 1–2, pp. 20–21. Genoa, 28th February 1934.

Commenting on the distribution of *Aspidiotus perniciosus*, Comst., in Europe, the author points out that the records in this *Review* of this species in France (and Algeria) [A **6** 411 ; **8** 450] and in Italy [**11** 114] are erroneous. At the present time, this scale occurs in Hungary and Austria [**20** 506], Portugal [**22** 5], Rumania [**22** 116] and Spain.

Mercet (R. G.). **Notas sobre Afelínidos (Hym. Chalc.), 6a nota.**—*Eos* **8** no. 4 pp. 353–365, 9 figs. Madrid, 31st December 1932. [?1933. Recd. March 1934.]

In 1924, Timberlake suggested that the genus *Aphytis*, erected by Howard in 1902 for a species named by him *A. chilensis*, should include the species of *Aphelinus* that parasitise Coccids, reserving *Aphelinus* for those that parasitise Aphids. This has been accepted by the author, who here modifies Howard's characters for *Aphytis* so as to include all the species that parasitise Coccids, and he distinguishes two subgenera, *Aphytis*, s. str., and *Prospaphelinus*, De Gregorio 1914. A key to the females of the European species is given, with notes on their synonymy, distribution and hosts.

Aphytis spp. are ectoparasites, at least when attacking Diaspine scales. The few species that parasitise other Coccids are noted with their hosts. The manner of oviposition on Diaspine scales is compared with that of *Aphelinus* in Aphids.

Uyttenboogaart (D. L.). **Revision des Genus *Tribolium* (Col. Ten.).** —*Ent. Bl.* **30** no. 1 pp. 20–31. Krefeld, 28th February 1934.

This revision includes a key to the subgenera and species of *Tribolium*, One new subgenus is erected and two new species are described. Of these, *T. destructor* was found at Erfurt attacking violet seed of unknown origin. In experiments, the larvae fed on various seeds, bran, wool, cotton, etc.

Scholz (R.). *Tribolium* (*Stene*) *destructor* **Uyttenb.**—*Ent. Bl.* **30** no. 1 pp. 44–45. Krefeld, 28th February 1934.

The larvae of *Tribolium destructor*, Uyttenb. [see preceding abstract] have been found attacking the roots of growing rye in Pomerania.

Korff (G.) & Böning (K.). **Sellerieffliegen und ihre Bekämpfung.** [Celery Flies and their Control.]—*Prakt. Bl. Pflanzenb.* **11** no. 11 pp. 261–265, 2 figs. Freising, 1934.

In Bavaria, the chief Dipterous pests of celery are *Acidia heraclei*, L., and *Psila rosae*, F. *A. heraclei* appears in April and oviposits on the leaves of celery, parsnip, *Heracleum* and various weeds [*cf. R.A.E.*, A **9** 550; **15** 158]. The larvae mine in the leaves, causing them to wither, and pupate either in them or in the soil at a depth of 2–4 inches. The pupae of the overwintering generation hibernate in the ground. Slight attacks are best checked by crushing the larvae in their mines or by destroying infested leaves. The ovipositing females can be repelled by strewing between the plants naphthalene [*cf.* **15** 340], tobacco dust, or sand soaked in kerosene, carbolic acid or a tar distillate, or by applying kerosene-soap emulsion to them, though this spray cannot be used on old plants, owing to its persistent odour. Hibernating pupae can be destroyed by a caustic manure applied after the harvest.

Adults of *P. rosae* emerge in spring from overwintered pupae and oviposit in cracks in the ground close to or on the celery roots [*cf.* **10** 105; **17** 725, etc.]. The larvae penetrate into the ground and begin feeding on the tips of the roots, a severe attack causing the leaves to wither. After 3–4 weeks they pupate, the adults emerging about 8 days later. The usual two generations are most harmful in June–July and August–September, but in some years there is a third, the larvae of which may do considerable damage in late autumn. Infested roots should not be left in the ground. Oviposition may be prevented by the repellents used against *A. heraclei*.

Beier (M.). **Orthopteroidea I.**—*Biol. Tiere Deutschlands*, Teil 26 pp. 1–231, 190 figs., 9 pp. refs. Berlin, Bortraeger, 1933. Subscription Price *M.* 16; single copies *M.* 19·20. [Recd. March 1934.]

In this section of a work of which other parts have been noticed [*R.A.E.*, A **20** 80, etc.], a general account is given of the morphology and bionomics in Germany of the cockroaches, Mantids and earwigs.

Ripper (W.). **Der russische Halmerdfloh. Ein neuer Getreideschädling.** [*Chaetocnema aridula*, a new Pest of Cereals in Austria.]—*Wien. landw. Ztg* 1934 no. 1 reprint 10 pp., 3 figs. Vienna, 6th January 1934.

In 1933, serious injury to wheat in Austria was caused by the larvae of *Chaetocnema aridula*, Gyll., few of the infested stems bearing full

ears. Such an outbreak had not previously been observed in Austria, though this Halticid is a serious pest in Russia [*R.A.E.*, A **20** 264; etc.]. Other cereals and certain grasses were also attacked. The larvae bore in the stems [**19** 659], and the adults feed on the leaves, this injury resembling needle-scratches between the leaf-veins. The adults hibernate at a depth of $2\frac{1}{2}$ inches or less in the soil in the fields, grass-banks and ditches; a 3 per cent. tar distillate, sprayed at the rate of about $\frac{1}{2}$ gal. per sq. yard, was found to destroy them.

VERESHCHAGIN (B.). **Păduchele lânos** [*Eriosoma lanigerum*] **în Basarabia.**—*Revista Horticola* no. 131 pp. 6–8, 2 figs., 1 ref. Bucarest, 1st January 1934.

The distribution in Bessarabia of *Eriosoma lanigerum*, Hsm. (woolly apple aphis) since 1913 is reviewed, and notes are given on remedial measures. Those considered most effective are fumigation with hydrocyanic acid gas and spraying in spring with 8 per cent. kerosene emulsion.

POLIZU (S.). **Cleştarul viţei de vie** (*Tetranychus althaeae* **v. Hanst.).** —24 pp., 1 fig. Chişinău [Kishinev], Stat. Fitopat., 1934.

This booklet contains a popular account of the biology and distribution in Bessarabia of *Tetranychus telarius*, L. (*althaeae*, v. Hanst.), which is an important pest of vines. The adults are described, and notes are given on the food-plants, the character of the damage caused to vines, the effect of meteorological factors, conditions of the soil and the situation of infested vineyards on the development of the mite, the resistance of the different varieties of vines to infestation, and measures for control.

HUKKINEN (Y.). **Tuholaistorjunnan opas. I. Tuholaisten torjunta hedelmä- ja marjaviljelyksessä.** [A Guidebook for Pest Control. Part I. Fruit and Berry Growing.]—*Tieto ja Taito* no. 65, 208 pp., 212 figs., 3 pp. refs. Borga-Helsingfors, Werner Soderström, Oy., 1933. Price 40 Finnish Marks.

This book deals with insects and other animal pests injurious to fruit trees and bush fruits in Finland. The importance and methods of pest control are explained, and notes are given on the bionomics of the individual pests (arranged according to the type of injury caused) and the measures to be taken against them. A bibliography of the more important Finnish and foreign literature and an index are appended.

VAPPULA (N. A.). **Tuholaisten esiintyminen v. 1932.** [The Occurrence of injurious Animals in Finland in 1932.]—*Valtion Maatalousk. Tied.* [*Bull. Govt agric. Res.*] no. 64, 5 pp., 2 figs. Borga, 1934.

Pests not mentioned in the report for 1931 [*R.A.E.*, A **21** 213, 214] comprise *Barathra* (*Mamestra*) *brassicae*, L., on cruciferous crops; *Chaetocnema concinna*, Marsh., and *Cassida nebulosa*, L., on sugar-beet; *Psila rosae*, F., on carrot in eastern Finland; *Cydia* (*Laspeyresia*) *nigricana*, Steph., on peas; *Anthonomus rubi*, Hbst., and *Batophila* (*Glyptina*) *rubi*, Payk., on strawberry; and *Psylla mali*, Schm., *Cheimatobia brumata*, L., *Hyponomeuta padellus malinellus*, Zell., *Rhynchites cupreus*, L., and *A. pomorum*, L., of which last this is the

first certain record in Finland, on fruit trees. In some districts, *Argyresthia conjugella*, Zell., injured 20–85 per cent. of the apple crop and *Cydia* (*Carpocapsa*) *pomonella*, L., 20–30 per cent. The larvae of *Diprion* (*Lophyrus*) sp. defoliated pine trees over large areas, and *Tortrix viridana*, L., caused considerable damage to oak. Pests of ornamental and greenhouse plants included *T. bergmanniana*, L., *Macrosiphum rosae*, L., *Trialeurodes vaporariorum*, Westw., and *Rhizoglyphus echinopus*, F. & R. *Ptinus fur*, L., *Ephestia kühniella*, Zell., and *Tribolium* sp. sometimes infested stored foodstuffs.

Listo (J.). **Uusi huomiota-ansaitseva omenapuutuholainen, omenan kellastajapunkki.** [A new notable Apple Pest, *Phyllocoptes schlechtendali*.]—*Puutarha* **36** no. 11 pp. 312–315, 2 figs., 4 refs. Hämeenlinna, 1933.

Listo (J.). **Vapaasti elävä äkämäpunkki *Phyllocoptes schlechtendali* omenapuutuholaisena.** [The free-living Gall Mite, *P. schlechtendali*, as an Apple Pest.]—*Luonnon Ystävä* **38** no. 1 pp. 17–21, 1 fig., refs. Helsingfors, 1934.

Notes are given on the distribution of *Phyllocoptes schlechtendali*, Nal., as a pest of apple in Finland, where it was first observed in 1926 and has since been found in 17 different localities, but not further north than 62° N. Lat. The mite lives on the leaves, and, when numerous, causes them to become discoloured and even to fall in the middle of the growing season [*cf. R.A.E.*, A **14** 190]. It is especially harmful in nurseries, from which it is spread to new localities. In experiments, spraying with lime-sulphur (1 : 30) has given satisfactory results.

Imms (A. D.). **A general Textbook of Entomology.**—Roy. 8vo, xii+727 pp., 624 figs., many refs. London, Methuen & Co., Ltd., 3rd edn. revd. & enl., 1934. Price 36*s*.

The third edition of this standard work [*R.A.E.*, A **13** 157; **18** 225] contains many additions and alterations. Much of the portion dealing with anatomy and physiology has been emended or rewritten in order to bring it in line with recent ideas and discoveries. In the chapter on Orthoptera, a section has been added concerning the phases of locusts. The Diptera have been reclassified under three sub-orders, the old and somewhat unnatural assemblage of the Orthorrhapha being no longer retained; the Calypterate Muscoids have also been grouped more in accordance with recent taxonomy. A number of supplementary references to the literature are given, and certain of the older citations omitted. Some 37 new illustrations have been included.

Hughes (A. W. McK.). **Aphides as Vectors of "Breaking" in Tulips. II.**—*Ann. appl. Biol.* **21** no. 1 pp. 112–119, 1 pl., 3 refs. London, February 1934.

From further experiments on "breaking" of tulips [*cf. R.A.E.*, A **18** 331; **19** 273], carried out in Surrey in 1930–33 with *Myzus persicae*, Sulz., *Macrosiphum solanifolii*, Ashm. (*gei*, auct.) and *Anuraphis tulipae*, Boy., it is concluded that "full break" ("white break") is a complex of two viruses, one of them being that of "self break" ("red break"), which was transmitted selectively by *Myzus* and *Macrosiphum* in some tests, though in others each species transmitted "full break." The latter is comparatively constant, but "self break" is unstable

and in a few plants the flowers have reverted to normal " breeders." There is evidence that certain varieties of tulip are more susceptible. It was established that " parrot " disease is not transmissible by Aphid vectors ; it is probably a mutation rather than a virus infection. " Clotted break " appears to be the manifestation of " full break " in dark purple and dark red varieties. Tulips definitely cease to be susceptible to the virus at a certain stage, which is presumably correlated with the time at which the new bulbs and off-sets become cut off by dead tissue. It is possible that large numbers of Aphids do not carry proportionately larger amounts of virus than small numbers, and more than 24 hours must elapse before an Aphid can pick up the virus from an infected plant. *A. tulipae* occurs frequently in bulb stores, and was found to be a definite vector of " breaking " when infesting bulbs, but not when feeding on the foliage.

The Braconid, *Aphidius matricariae*, Hal., parasitised *Macrosiphum*, and to a less extent *Myzus*, in experimental plots.

SPEYER (E. R.). **Some common Species of the Genus *Thrips* (Thysanoptera).**—*Ann. appl. Biol.* **21** no. 1 pp. 120–152, 9 figs., 2 pls., 5 refs. London, February 1934.

A more detailed account is given of breeding experiments with thrips already noticed [*R.A.E.*, A **21** 487], and a technique for their collection and preservation is described. *Thrips banaticus*, Knechtel, which Priesner considered to be a variety of *T. fuscipennis*, Hal., is shown to be a synonym of *T. major*, Uzel. New structural characters of value in differentiating the species of *Thrips* are described, and diagnostic characters of 10 common British species are shown. A general account is given of their biology, with more detailed notes on *T. tabaci*, Lind., and *T. fuscipennis* [*cf.* **20** 483] and brief ones on *T. major* and *T. flavus*, Schr., which are considered of no economic importance. Suggestions for a more satisfactory classification of the Thysanoptera are briefly outlined.

NEWTON (H. C. F.). **On the Biology of *Psylliodes hyoscyami* Linn. (Chrysomelidae, Coleoptera), the Henbane Flea-beetle, with Descriptions of the Larval Stages.**—*Ann. appl. Biol.* **21** no. 1 pp. 153–161, 3 figs., 2 pls., 7 refs. London, February 1934.

Psylliodes hyoscyami, L., was discovered infesting henbane (*Hyoscyamus niger*) on a herb farm in Hertfordshire in 1929. The developmental stages of this Halticid are described, and records of its foodplants and distribution in Europe are reviewed. A few beetles were found on a neighbouring strip of *Atropa belladonna*, on which they fed in the laboratory when deprived of other food. They refused leaves of potato and tobacco.

The adults hibernated during the winter in long grass near the henbane. By the end of April, large numbers were found congregated on the roots and stems of young plants that had been partly ploughed in. In the laboratory, eggs were laid in the soil in May, and none could be found on the leaves or stems in the field. Cast skins of the first-instar larvae, however, have been observed in mines in the upper part of the plants, and it is difficult to believe that the young larvae can travel over the sticky, hairy surface of the stems. The incubation period was about 2 weeks (14th–28th June). Oviposition continued during May and June. The larvae lived entirely within the plant,

mining the leaf stalks and mid-ribs and sometimes even the leaf blades and hollowing out the pith of the main stem. Some were found in the tap root. They completed their growth from the second week of June 1930, and pupated in earthen cells in the soil, generally 2–3 ins. below the surface. Adults emerged at the end of July and in early August, and females of this generation probably oviposited in the following spring.

The mining causes serious set-back and even death, especially when a virus disease [*cf. R.A.E.*, A **21** 2] is also present. The main crop should be harvested early in June, when many larvae are still in the plant. Crops of henbane should not be grown continuously in adjacent plots, and provision should be made for seed production elsewhere.

Insect and allied Pests of cultivated Mushrooms.

Jary (S. G.). **I. The Incidence of Attacks and their Relation to Growing Practice.**—*Ann. appl. Biol.* **21** no. 1 pp. 162–167. London, February 1934.

Austin (M. D.). **II. Laboratory Investigations.**—*T.c.* pp. 167–171.

In the first paper, a brief account of mushroom cultivation in England is given. Certain pests that are common in buildings adapted for mushroom growing, particularly where half-rotten straw occurs in damp dark situations, are rarely found in buildings specially erected. They include millepedes and woodlice, *Oniscus asellus*, L. [*R.A.E.*, A **21** 397] being of common occurrence, though *Porcellio scaber*, Latr. [**10** 49] and *P. laevis*, Latr., may also injure the caps. These may play a part in the spread of fungus diseases. Watering or dusting with pyrethrum is recommended. Mites, especially *Tyroglyphus mycophagus*, Megn. [**21** 397], which eat shallow irregular holes in the caps and stems, Collembola [**21** 110, 487], which cause small lesions in the stems and the edges of the caps, and Phorid larvae, which tunnel in the stems and caps, are probably introduced with the manure compost. Mites and fly larvae are also suspected of injuring the mycelium running in the beds. The turning of manure heaps reduces infestation. Attempts are being made to treat manure compost with steam and insecticides, and it is advisable to sterilise casing soil.

Sciara spp. [**21** 397, 489, etc.], the only pests specific to mushrooms, are dealt with more fully in the second paper. In biological studies, pairing flies or eggs were introduced into glass cylinders with cellophane tops that enclosed individual mushrooms growing in boxes and protected from infestation. Flies were also reared successfully in jars containing steam-sterilised compost with the addition of mushroom spawn [*cf.* **17** 612] or even in the absence of mushrooms.

The pre-oviposition period of *S. fenestralis*, Zett., was 2–3 days. The larvae of these Mycetophilids sever the mycelial strands from the stems and are suspected of damaging the spawn before it has begun to grow. The larval tunnels frequently become secondarily infested with other flies, Collembola and mites. Phorid pupae were present in the straw covering on outdoor beds, and it was necessary either to treat the straw or to remove it altogether. Infestation by Phorids, originating between spawning and casing, was especially frequent in outdoor beds, the commonest species being *Megaselia* (*Aphiochaeta*) *albidihalteris*, Felt. There was often a high degree of pupal parasitism, chiefly by *Aspilota concolor*, Nees [*cf.* **21** 110], but it was not much in evidence until the Phorids were well established.

Hodson (W. E. H.). **Control of Strawberry Pests by Hot-water Treatment of Runners.**—*J. Minist. Agric.* **40** no. 12 pp. 1153–1161, 1 pl., 8 refs. London, March 1934.

In experiments in southern England, hot-water treatment of strawberry runners apparently gave good control not only of *Tarsonemus fragariae*, Zimm. [*cf. R.A.E.*, A **21** 447, etc.] but also of *Tetranychus telarius*, L., and *Capitophorus potentillae*, Wlk. (*fragariae*, Theo.). In early November 1932, 2,000 runners (about 250 in each net) were immersed in water at 112°F., which fell almost immediately to 110°F. and was kept at this temperature for 20 minutes. The resulting plants remained remarkably free from pests throughout the year and provided nearly twice as many vigorous runners as the controls. Plants from runners treated in batches at fortnightly intervals during the winter and afterwards dried and transported by rail remained healthy throughout 1933. The time of total immersion should be exactly 20 minutes at a uniform temperature of 110°F.; runners should be placed in the water loosely to allow the heat to penetrate, weak and poorly rooted runners should not be treated, and treatment should preferably be carried out at a time (early autumn or mid-spring) when immediate planting and active growth are possible.

The " Degeneration " of the Strawberry.—*Tech. Commun. Bur. Fruit Prod.* no. 5, 28 pp., many refs. East Malling, February 1934.

The possible causes of the degeneration of strawberry plants in Britain are discussed from the literature in four sections, of which the second by R. V. Harris is entitled " Virus as one Cause of Strawberry Degeneration " (pp. 11–15), and the fourth by A. M. Massee, " The Insects and other Animals associated with Degeneration of the Strawberry " (pp. 20–28).

Report of the Department of Agriculture and Forests, Palestine, for the Years 1931 and 1932.—Fol. 239 pp. Jerusalem, 1933. [Recd. March 1934.]

The Report of the Horticultural Service, by A. G. Turner, contains a reference (p. 68) to the grafting of vines on resistant American stocks in the three districts of Palestine known to be infested by *Phylloxera*.

In the Report of the Entomological Service (pp. 85–94), E. Ballard states that 42,503 *Citrus* trees were fumigated with calcium cyanide in the Jaffa district in 1931 against *Chrysomphalus ficus*, Ashm.; of these, 13,953, which were known to be infested, were treated with a double dosage in order to defoliate them and kill all the scales. The number of infested trees was reduced by 44 per cent. at an approximate cost of a little over £2,000. Fumigation should be carried out annually in infested groves [*cf. R.A.E.*, A **20** 351], but many of these contain trees that are not worth the cost of treatment. The number of almond and apricot trees that had to be destroyed owing to infestation by *Capnodis carbonaria*, Klug (almond borer) was appreciably reduced [*cf. loc. cit.*]. Pomegranates were protected with some success in 1932 against the Lycaenid, *Virachola livia*, Klug, by enclosing the young fruit in paper bags before the butterflies had oviposited on them. *Cosmopolites sordidus*, Germ., was intercepted in imported banana pseudo-stems.

STEWART (H. R.). **Entomology.**—*Rep. Dep. Agric. Punjab 1932–33* pt. 1 pp. 35–39. Lahore, 1934.

The work on insect pests in the Punjab during the year ending 30th June 1933 is outlined. A new Pyralid found on sugar-cane for the first time in the preceding year has a life-cycle of 69–84 days, which is the maximum recorded for any cane borer. The larvae hibernate in the cane stubble from October to June. Hand-nets for the control of *Pyrilla* should be utilised immediately after wheat is harvested, when the adults begin to migrate to the young cane. Extensive investigations indicated that light-traps are of no value in the control of rice borers [*Schoenobius bipunctifer*, Wlk.], and that clean cultivation and burning the stubble after harvest are the only effective measures. Infestation varied in the early sown rice from about 3 to 5 per cent. and in the late sown from 21 to 56 [*cf. R.A.E.*, A **21** 552].

A spraying campaign in hill districts has given good results against the San José scale [*Aspidiotus perniciosus*, Comst.] on apple, peach, plum, apricot and chestnut.

FLETCHER (T. B.). **Life-histories of Indian Microlepidoptera (Second Series) Alucitidae (Pterophoridae), Tortricina and Gelechiadae.**—*Sci. Monogr. imp. Coun. agric. Res.* [*India*] no. 2, 58 pp., 35 pls. Calcutta, 1932. Price 5*s.* 6*d.* **Cosmopterygidae to Neopseustidae.**—*Op. cit.* no. 4, 85 pp., 77 pls. Delhi, 1933. Price 7*s.* 6*d.*

These monographs comprise further information on some of the species dealt with in the First Series [*R.A.E.*, A **9** 272], including records of food-plants, etc., in other countries as well as in India, and notes, generally brief, on 250 additional species. Those recorded from economic plants in India include: *Ulodenus trigrapha*, Meyr., rolling *Citrus* leaves in Shillong; *Eucosma* (*Spilonota*) *rhothia*, Meyr., on guava; *E. rhothia* and *Polychrosis cellifera*, Meyr., on *Eugenia jambolana*; *Phthorimaea heliopa*, Lw., on egg-plant (*Solanum melongena*); *Anarsia omoptila*, Meyr., on *Cajanus indicus*; *Prays endocarpa*, Meyr., in fruits of *Aegle marmelos*; and *Trochilium* (*Aegeria*) *ommatiaeforme*, Moore, destroying young poplar trees in Baluchistan. Larvae of *Stathmopoda melanochra*, Meyr., were found preying on *Icerya purchasi*, Mask., in the Nilgiri Hills.

KALSHOVEN (L. G. E.). **A large Longicorn Borer in the Base of Trees of** *Schima noronhae* **Reinw.** (*Trachylophus approximator* **Gah.).** [*In Dutch.*]—*Tectona* **26** (1933) no. 6 pp. 498–507, 2 pls.; Engl. abstr. pp. 506–507).—(Abstr. in *Exp. Sta. Rec.* **70** no. 1 p. 67. Washington, D.C., January 1934.)

An account is given of the Cerambycid, *Trachylophus approximator*, Gah., attacking *Schima noronhae* in young forest plantations in the Netherlands Indies about 460 feet above sea level.

CHAN (Kwai-Shang). **A Galerucid Beetle injurious to Cucurbits.**—*Lingnan Sci. J.* **13** no. 1 pp. 103–107, 1 fig. Canton, China, 27th January 1934.

A Galerucid, *Ceratia* (?) *orientalis*, Hornst., is one of the most serious pests of *Luffa acutangula* in Kwangtung, and is able to complete its life-cycle on other cucurbits. Other plants sometimes attacked include

cowpeas (*Vigna* spp.) and egg-plant (*Solanum melongena*). The stages are briefly described, and data regarding pairing and fecundity are given. The adults hibernate on the lower surface of the leaves of trees, shrubs or cultivated crops, or among the old vines remaining in the fields after harvest and dry plants and rubbish on the ground. Pairing and egg-laying occur 6–10 and 7–15 days respectively after emergence, probably beginning about 22nd March, when feeding was first observed in the field in 1933, and continuing at least until 9th November. A maximum of 1,519 eggs was laid by a female that may possibly continue to oviposit after hibernation. Between 12th August and 12th September, at average temperatures ranging from 79 to 87·16°F., the egg-stage of 8 selected individuals lasted 8 days, the larval stage 15–17 (including a prepupal period of 4–5) and the pupal 6. There are thus at least 5–6 generations a year in the Canton district. During July–October, females were more numerous than males in the field. The feeding habits of larvae and adults and the natural enemies are similar to those of *Rhaphidopalpa* [*R.A.E.*, A **22** 18], and the same control measures would probably be applicable.

YEUNG (K. C.). **The Life History of the Tortoise Beetle, *Metriona circumdata* Hbst. (Coleoptera, Cassididae).**—*Lingnan Sci. J.* **13** no. 1 pp. 143–162, 2 pls., 6 refs. Canton, China, 27th January 1934.

Metriona circumdata, Hbst., all stages of which are described, causes considerable damage annually in the Canton district to the leaves of sweet potato (*Ipomoea batatas*), swamp-cabbage (*I. reptans*) and morning glory (*I. purpurea*). The young larvae skeletonise the leaves, the older ones and the adults perforate and sometimes almost entirely consume them, and the adults may also feed on the outer epidermis of the vines. This Cassidid is often associated on *Ipomoea* with *Laccoptera quadrimaculata*, Thnb. (*chinensis*, Boh.) [*cf. R.A.E.*, A **21** 327]. It is generally of minor importance, though becoming rather injurious at certain times in limited areas. Pairing, which apparently takes place more than once, and oviposition were observed after an average of 12·5 and 13·8 days from emergence. The oviposition period averaged 3 weeks, the number of eggs 271 and the egg, larval and pupal stages (in hot weather) 5, 12 and 4½ days. There are probably 5–6 generations a year. The eggs are usually laid singly on the leaves or petioles.

Arsenical sprays, hand-picking and clean cultivation are recommended for control.

HARUKAWA (C.), TAKATO (R.) & KUMASHIRO (S.). **Studies on the Seed-corn Maggot. III. On the Method of Control of the Seed-corn Maggot. (I.).**—*Ber. Ōhara Inst. landw. Forsch.* **6** no. 1 pp. 83–111, 10 refs. Kurashiki, 1933. [Recd. March 1934.]

In further work in Japan [*cf. R.A.E.*, A **21** 402; etc.], preliminary experiments were undertaken to discover materials toxic or repellent to *Phorbia* (*Hylemyia*) *cilicrura*, Rond., on germinating seeds and seedlings of soy beans. Almost all the larvae and pupae, but only about 50 per cent. of the eggs, were killed in the laboratory by immersion for 4 days in water at 30°C. [86°F.]. This temperature, however, would not be maintained in the field during March–June and late

September–November, when the infestation is most severe, and immersion at lower temperatures was less effective, particularly in the case of pupae. Small scale tests in which contact insecticides were applied to the soil did not indicate a promising method of control. Considerable numbers of adult flies, including a high percentage of females, were caught by means of glass fly-traps baited with dried pupae of the silkworm [*Bombyx mori*, L.] or dry cotton-seed meal and containing soap solution. As the pre-oviposition period occupies 1–2 weeks, one of these baits used with a poison might prove of practical value. The silkworm pupae were more effective than the meal, but both were markedly more attractive and more lasting in effect than ethyl alcohol, ammonia, alcoholic solution of esters or human excreta, which last have previously been considered very attractive to *P. cilicrura* in Japan. The use of cotton-seed meal or human excreta as fertilisers should be avoided.

Further experiments indicated that damage may be reduced by covering the surface of the fields with newspaper or cloth, but such covers retard germination and the growth of the seedlings and may sometimes render the plants attractive to larvae already in the soil. Creosote oil emulsion and mixtures of fine sand and creosote oil or coal tar showed some promise as repellents for preventing oviposition. Treatment of the seeds to repel the larvae did not prove satisfactory ; as the eggs are laid on the surface of the soil, the repellent did not reduce oviposition, and it was soon absorbed by the soil. Coal-tar and creosote oil retard germination and if used at strong concentrations kill the seeds, which thus become especially attractive to the larvae.

HAYASHI (I.). **Ecological Relation between Parasitic Insects and their Hosts.** [*In Japanese.*]—*Bot. & Zool.* **1** no. 9 pp. 1289–1296, 3 figs. Tokyo, September 1933.

Malacosoma neustria var. *testacea*, Motsch., is a very common pest of cherry, plum and other Rosaceae in central Honshu. The eggs of this Lasiocampid are attacked by *Telenomus* sp. and *Aphycoideus* sp., the percentage parasitised being sometimes as high as 55·8 by the two species or 41·3 by *Aphycoideus* alone. Only 0·2 per cent. are killed by bacteria and other enemies.

The larvae and pupae are parasitised by *Apanteles rubripes*, Hal., *A. japonicus*, Ashm., *Hyposoter* (*Limnerium*) *disparis*, Vier., *Pimpla pluto*, Ashm., *P. persimilis*, Ashm., *P.* (*Apechthis*) *japonica*, D. T., *Rhythmonotus takagii*, Mats., *Brachymeria obscurata*, Wlk., *B.* (*Chalcis*) *euploeae*, Westw., *Monodontomerus spectabilis*, Mats., *Tachina larvarum*, L., *Carcelia gnava*, Mg., and *Pales* (*Neopales*) *pavida*, Mg., and are also attacked by the predators, *Polistes* spp., *Calosoma* sp., the Reduviid, *Isyndus obscurus*, Dallas, spiders and sparrows (*Passer montanus*). In 1925, 62 per cent. of the larvae were killed by the Tachinids (of which *T. larvarum* was the most abundant), 8 per cent. by *Apanteles* spp. and 21·5 per cent. by *Polistes* spp. Most of the parasites also have other hosts, and the species of *Apanteles* are themselves attacked by hyperparasites, including *Eurytoma appendigaster*, Swed.

KAMIYA (K.). **On the Life-history of** *Dendrolimus superans* **Butl. (1).** [*In Japanese.*]—*Kagaku no Nogyo* (*Sci. Agric.*) **14** no. 6 pp. 17–25, 1 pl. Tokyo, December 1933.

Descriptions are given of the egg, larva, pupa and cocoon of *Dendrolimus superans*, Butl., which is very common near Tokyo. The larvae

feed on the needles of *Pinus*, *Tsuga* and *Abies*, sometimes killing the trees. They hibernate in the fifth or sixth instar in crevices on the bark of the trees, among fallen leaves, etc., and begin to be active in April, becoming full-grown from the end of June to the middle of July. The larval stage, comprising 6–8 instars, occupies nearly the whole year. Pupation occurs in July, and the pupal stage averages 18 days for females and 19 for males.

ARAKAWA (Y.) & AKIYAMA (T.). **On the Life-history of *Illiberis pruni* Dyar in Manchuria.** [*In Japanese.*]—*J. Plant. Prot.* **20** no. 7 pp. 530–537. Tokyo, July 1933.

The larvae of the Zygaenid, *Illiberis pruni*, Dyar, feed from July to September on the leaves of a species of apple indigenous to Manchuria, hibernating in the second or third instar in the crevices on the stems. They become active and pupate about the end of May, the moths emerging 1 or 2 weeks later. The eggs are deposited in masses of 50–200 and hatch in July.

MURAKAMI (S.). **Results of Studies on *Cylas formicarius*, Fab. 2.** [*In Japanese.*]—*J. Plant Prot.* **20** no. 12 pp. 934–945. Tokyo, December 1933.

Damage to sweet potato by *Cylas formicarius*, F., in the Loochoo Islands [*cf. R.A.E.*, A **22** 114] is increasing. It is especially serious in dry years and in mid-summer. The weevils are most active at midday and are sometimes attracted to light. Pairing takes place a week after emergence, and oviposition 2 or 3 days later. The egg-stage lasts about 3 days in July and August and longer at cooler seasons ; the eggs are laid singly on the tubers exposed above ground or on the basal parts of the stalks, and also on the tender stalks of other species of *Ipomoea*. Females in captivity laid an average of 80 during life and oviposited up to 5 times, the maximum number of eggs at one oviposition being 36. The larvae are more injurious than the adults, and the pupal stage lasts some 10 days. Burning the infested parts of the plants after harvest, destruction of other species of *Ipomoea*, and crop rotation are recommended for control.

KUWAYAMA (S.). **Some Problems in the Control of *Lema oryzae*, Kuw., from an ecological Standpoint.** [*In Japanese.*]—*J. Plant. Prot.* **21** nos. 1–2 pp. 13–17, 99–102. Tokyo, January–February 1934.

The larvae of *Lema oryzae*, Kuw., have hitherto been known to feed only on rice [*R.A.E.*, A **20** 459], but recently both larvae and adults have been discovered attacking the grass, *Glyceria tonglensis*, in Hokkaido. The adults hibernate in various places, but control is only possible in the rice-fields. Lead arsenate is not effective against either adults or larvae. Of contact insecticides, pyrethrum is the most effective and seems also to have an ovicidal action. Control by collecting the larvae with nets in early morning is convenient and effective.

TAKAHASHI (S.). **On the Insect Pests of Silk Threads.** [*In Japanese.*] —*J. Plant Prot.* **21** no. 1 pp. 22–28. Tokyo, January 1934.

Some 22 insects were observed to attack silk thread in Japan, amongst which *Attagenus japonicus*, Reitt. [*cf. R.A.E.*, A **18** 191] is

most injurious to the thread in store, while *Anthrenus verbasci*, L., causes damage in weaving mills. These beetles visit flowers out of doors, but can only breed in buildings.

ODA (F.). **On the serious Outbreaks of** *Lyonetia clerkella*, **Linn., at Nittahara, Fukuoka Prefecture.** [*In Japanese.*]—*J. Plant Prot.* **21** no. 1 pp. 46–52. Tokyo, January 1934.

Lyonetia clerkella, L., long known as a pest of peach in southern Japan, caused serious damage in 1928 in Fukuoka Prefecture. The trees were defoliated and yielded no crop in that year and a much reduced one in the following 2 or 3 years. In 1933 there was a further outbreak, but the injury was minimised by spraying with neoton (a derris insecticide) and nicotine sulphate, which are effective against the moths as well as the larvae. This Tineid also attacks cherry, pear, apple, apricot and plum, and has 7 generations a year, hibernating in the adult stage. The moths, which live for 3–5 days in summer, are active from May to November and most abundant from July to September. The life-cycle is completed in about a month, the pupal stage lasting 5–7 days. The eggs are laid singly on the leaves, and the larvae mine in them, pupating on the lower surface.

MOTOIKE (T.). **On two Insect Pests of Tomato.** [*In Japanese.*]—*J. Plant Prot.* **21** no. 2 pp. 108–111. Tokyo, February 1934.

Descriptions are given of *Heliothis* (*Chloridea*) *assulta*, Gn., which feeds on the fruit of tomato, and *Prodenia litura*, F., which infests the stalks, leaves and fruit, in Shiga Prefecture.

MATSUBARA (S.). **The Use of Fumigants against** *Balaninus dentipes* **Roelofs and** *Laspeyresia* **sp., and their Effect on Chestnuts.** [*In Japanese.*]—*Agric. & Hort.* **8** no. 12 pp. 2768–2780. Tokyo, December 1933.

Notes are given on *Curculio* (*Balaninus*) *dentipes*, Roel., and *Cydia* (*Laspeyresia*) sp., which are widely distributed in western Japan as chestnut pests, the former being the more injurious. For fumigating the harvested nuts, carbon bisulphide is satisfactory, as it does not injure them, whereas chloropicrin causes rotting.

HARUKAWA (C.). **Is it possible to control** *Sitotroga cerealella* **Olivier by Heat Treatment ?** [*In Japanese.*]—*Agric. & Hort.* **9** no. 2 pp. 451–458. Tokyo, February 1934.

Sitotroga cerealella, Ol., is one of the most injurious pests of stored wheat in Japan. The eggs were killed by exposure to 60°C. [140°F.] for 5 minutes. The percentage mortalities of the larvae and pupae obtained were : 27 after 2 hours and 86 after 4 at 50°C. [122°F.] ; 98 after 3 hours at 55°C. [131°F.], 1 hour at 60°C. or 40 minutes at 65°C. [149°F.] ; 96 after 20 minutes at 70°C. [158°F.] ; 99 after 20 minutes at 80°C. [176°F.] ; and 100 after 30 minutes at 70°C. The young larvae are less resistant to heat than the older ones. Heating at 60°C. or above scarcely affected the germination of the wheat seed.

Sakai (K.). **Considerations on the Hibernation of** *Deltocephalus dorsalis,* **Motsch.** [*In Japanese.*]—*Insect World* **37** no. 12 pp. 409–413. Gifu, December 1933.

In Kyushu, *Deltocephalus dorsalis,* Motsch., a Jassid injurious to rice, usually hibernates in the egg-stage [*cf. R.A.E.*, A **18** 555] in the basal parts of the lowest leaf-sheaths of the food-plant, the eggs hatching at the end of April and beginning of May, but some adults may overwinter in sheltered places.

Takahashi (S.). **On the serious Damage to Cruciferous Vegetables caused by Drought and Aphids in Kanto District in the Autumn of 1933.** [*In Japanese.*]—*Insect World* **38** no. 1 pp. 2–9. Gifu, January 1934.

In 1933, crucifers in the Tokyo district were severely damaged by drought and the accompanying outbreaks of *Aphis* (*Rhopalosiphum*) *pseudobrassicae,* Davis.

Hirose (K.). **Effectiveness of collecting Beetles at Flowers as a Control Measure against** *Anthrenus verbasci,* **Linn.** [*In Japanese.*]—*Insect World* **38** no. 2 pp. 50–52. Gifu, February 1934.

As the adults of *Anthrenus verbasci,* L., a pest of stored products of animal origin, visit the flowers of various composite plants in very large numbers, advantage should be taken of this habit by collecting and destroying them.

Watanabe (C.). **On three Species of Braconids bred from some Larvae of Pyralids.** [*In Japanese.*]—*Kontyû* **7** no. 5–6 pp. 245–248. Tokyo, December 1933.

Descriptions are given of the adults of *Microbracon* (*Habrobracon*) *hebetor,* Say, reared from *Pyralis farinalis,* L., *Chelonus inanitus,* L., from *Sylepta derogata,* F., and *Macrocentrus japonicus,* Watan., from *Margaronia pyloalis,* Wlk.

Sakai (K.). **A Scolytid attacking the Root of Derris.** [*In Japanese.*]—*Kontyû* **7** no. 5–6, pp. 272–273. Tokyo, December 1933.

In Kyushu, the Bostrychid, *Sinoxylon anale,* Lesne (*geminatum,* Schilsky) has been found seriously attacking stored derris roots [*cf. R.A.E.*, A **21** 677].

Takagi (G.). **On the intermediate Host of** *Melaphis chinensis* **Bell.** [*In Japanese.*]—*Dobuts. Zasshi* **46** no. 544 pp. 27–33. Tokyo, February 1934.

The galls of *Melaphis chinensis,* Bell, on *Rhus* contain tannin and are very useful [*cf. R.A.E.*, A **6** 45 ; **8** 2]. Hitherto it has been impossible to breed this Aphid, since the winter food-plant was unknown, but in 1933 at Keijo, Korea, the winged Aphids migrated from the galls in early autumn to the moss, *Mnium vesicatum,* and produced young upon it. In experiments, they did not deposit young on other mosses.

Ishikawa (K.). **On the Morphology of** *Tricholyga sorbillans* **Wiedem.** [*In Japanese.*]—*Dobuts. Zasshi* **46** no. 544 pp. 43–52, 3 figs., 1 pl. Tokyo, February 1934.

Detailed descriptions are given of all stages of the Tachinid, *Tricholyga sorbillans*, Wied., which is parasitic on the silkworm [*Bombyx mori*, L.] when bred out of doors in Japan, but apparently does not enter houses. The eggs, which hatch in 2–3 days, are generally laid upon the thorax and first abdominal segment, 3 or 4 eggs being usual on a single caterpillar. The maggots live just under the skin of the host, causing black patches to appear on it.

Caresche (L.). **La mouche des fruits. Danger de son introduction en Indochine et mesures de protection à appliquer.**—*Bull. écon. Indochine* **36** pp. 1006–1014, 1 pl., 1 fldg. table, 6 refs. Hanoi, 1933.

In view of the danger of the introduction of *Ceratitis capitata*, Wied., into Indo-China, where climatic conditions would be favourable to it and fruit is extensively cultivated, the importation of all fruits from countries where it occurs has recently been prohibited. An account is given of its life-history, with brief descriptions of all stages and notes on the species of fruits it attacks and its distribution and control. The temperature of 4–8°C. [39·2–46·4°F.], at which ships' refrigerators are kept, is not low enough to kill eggs or larvae in fruit.

Bhatia (H. L.) & Shaffi (Mohammad). **Life-histories of some Indian Syrphidae.**—*Indian J. agric. Sci.* **2** pt. 6 pp. 543–570, 8 pls., 23 refs. Calcutta, 1933. [Recd. March 1934.]

A list is given of the Syrphids the larvae of which are recorded in the Pusa collection as predacious on Aphids in India. Of the species observed by the authors, *Xanthogramma* (*Sphaerophoria*) *javanum*, Wied., which also attacked Aphids on cotton, and *Baccha pulchrifrons*, Aust., were predacious on the Psyllid, *Ctenophalara elongata*, Cwfd., on *Bombax malabaricum*. The incubation, larval and pupal periods respectively of *X. javanum* were 2, 10–15 and 8–10 days; of *B. pulchrifrons*, 1–2, 11–18 and 8–11 days; and of *Syrphus balteatus*, DeG., which attacked Aphids on cotton, about 2, 10–14 and 9–11 days. The larval and pupal periods of *Helophilus bengalensis*, Wied., which fed on fly larvae and rotting wood in the laboratory, were 16 and about 8 days, and those of *Paragus serratus*, F., about 1 week each. This species and *S. confrater*, Wied., which had a pupal period of about 12 days, preyed on Aphids on a variety of plants. The pupal period of *S. serarius*, Wied., was about 8 days and that of *S. isaaci*, sp.n. (in February) about 2 weeks; both species attacked Aphids on mustard. The larva, pupa and adult of *S. isaaci* and the immature stages of the other Syrphids, so far as observed, are described. *Ischiodon scutellaris*, F., a common predator on Aphids, was parasitised by the Ichneumonid, *Bassus multicolor*, Grav.

Negi (P. S.). **A simple Method for the Forecast of Emergence of Lac Larvae, and a Description of the Myology of the Adult Female Lac Insect,** *Laccifer lacca* **Kerr (Coccidae).**—*Indian J. agric. Sci.* **3** pt. 6 pp. 1085–1097, 2 pls., 10 refs. Delhi, 1934.

A method is given in detail by which, with the use of the accompanying illustrations, the time of emergence of the larvae of *Laccifer*

lacca, Kerr, from the test of the female (the musculature of which is described) may be forecast by the growth on the test of a yellow area and the changes in its colour due to the withdrawal of the insect body from it [*cf. R.A.E.*, A **19** 600] and by the deposition of white wax filaments from the perivaginal glands and of eggs.

[Zhdanov (S.).] **Жданов (С.). The Moroccan Locust (*Dociostaurus maroccanus*, Thnb.) in the Stavropol Province (N. Caucasus).** [*In Russian*].—*Bull. Plant Prot.* Ser. 1 no. 9 pp. 3–51, 10 figs., 58 refs. Leningrad, 1934. (With a Summary in English.)

The ecology of *Dociostaurus maroccanus*, Thnb., in the Stavropol region, North Caucasus, and in particular the vegetative cover and the microclimate of the breeding places were studied for three years.

The principal habitat in which the eggs are laid was overgrazed pasture, characterised by very firm soil and sparse vegetation, *Poa bulbosa* being typical. They are usually laid amongst the sod of this grass, probably because at the time of oviposition (when the soil of the habitat is very dry) the humidity is lowest in the sod. This is not, however, a preferred food-plant, since it is quite dry at the time of oviposition and females have to fly daily to the feeding grounds.

The locust does not occur in the normal virgin steppes of the region, which are characterised by a relatively dense cover of *Stipa*, *Festuca sulcata* and other grasses that require a moderate degree of humidity, but becomes common only when the original vegetation is destroyed by overgrazing. It probably appeared in the North Caucasus only about 100–120 years ago, when the country was colonised and the rearing of cattle developed. Although they are thus artificial, the breeding areas are fairly constant, and are all situated in a zone with 15–20 ins. of annual precipitation.

The periodicity of mass outbreaks is more pronounced in some breeding areas than in others. The regulating factors are complex, the most important being fungus diseases of the eggs, which in their turn depend on the weather. Outbreaks are favoured by years when the spring and late summer are dry.

Since the breeding areas have been created by man, it should be possible to control the locust by altering their ecological conditions. The substitution of cultivated forage plants for natural pasture, or the adoption of practices that check overgrazing and the spread of *Poa bulbosa*, is suggested.

[Zakhvatkin (A. A.).] **Захваткин (А. А.) Les parasites du criquet marocain en Azerbaidjan.** [*In Russian.*]—*Bull. Plant Prot.* Ser. 1 no. 9 pp. 52–71, 5 figs., 6 refs. Leningrad, 1934. (With a Summary in French.)

The parasites of egg-pods of *Dociostaurus maroccanus*, Thnb., observed in Azerbaijan included the Meloids, *Mylabris zebraea*, Mars., and *M. fusca*, Ol., all stages of which are described in detail, with figures and some observations on their bionomics. A key is given to the triungulins of these species and five others of the same genus that occur in Azerbaijan in the same habitat as the locust but have not been recorded as parasitic on it there. *Cytherea armeniaca*, Paramonov, is a much less important parasite of the egg-pods, and another Bombyliid, *Anastoechus mylabricida*, sp. n., the adult, larva and pupa of which

are described, proved to be a secondary parasite in them, developing on the larvae of Meloids, particularly *M. zebraea*.

Parasitism of the egg-pods by these insects is sometimes as high as 100 per cent., though it averages only 22·4 per cent. A fungus, *Fusarium* sp., which develops in spring, destroys on the average another 24·6 per cent.

KEMNER (N. A.). **Om insekter och insektskador i herbarier.** [On Insects and Insect Damage in Herbaria.]—*Bot. Notiser* no. 1–3 pp. 439–455, 7 figs. Lund, 1933.

The author divides the insects found in herbaria into three groups, *viz.*, species that are sometimes introduced with the plants from the field, those that are often associated with herbaria but do not damage them, and those that actually feed on the dried plants. The last group includes *Sitodrepa panicea*, L., *Ptinus fur*, L., *Liposcelis* (*Troctes*) *divinatorius*, Müll., *Trogium* (*Atropus*) *pulsatorium*, L., and *Lepisma saccharina*, L., besides the pseudoscorpion, *Chelifer cancroides*, L. The Lathridiid, *Cartodere filum*, Aubé, may be sometimes beneficial, as it feeds on fungus spores and hyphae, but when it becomes numerous it does serious damage. The measures advocated are fumigation with various substances (none of which, however, has proved an efficient preventive) and painting over the plants with mercury bichloride solution.

BAUDYŠ (E.). **Fytopathologické poznámky VIII. (za rok 1932).** [Phytopathological Notes for 1932.]—*Ochr. Rost.* **13** no. 3–4 pp. 90–102, 5 figs. Prague, 1933. (With a Summary in German.) [Recd. March 1934.]

In the autumn of 1932, wireworms caused considerable damage in Czechoslovakia to cereals and various vegetables, especially lettuce. *Euxoa* (*Agrotis*) *segetum*, Schiff., was very abundant and infested plants not usually attacked, such as onion. The addition of 2 per cent. kerosene to arsenical sprays used for its control is suggested, to repel cattle or other animals from feeding on the treated plants. Owing to the use of chemical manures, infestation of vetch by *Dasyneura viciae*, Kief. [*cf. R.A.E.*, A **17** 205] was reduced to 2–3 per cent., only the leaves being attacked and the plants not stunted.

In a nursery near Brno, all young cultivated carnations were destroyed by an Anthomyiid, either *Hylemyia nigrescens*, Rond., or *H. cardui*, Mg., the larvae of which hollowed out the stems. The infestation was more severe in shaded places and on light soil, and the common varieties of carnations suffered most. The eggs were laid at the base of the leaves or on the stalk.

Různé zprávy. [Miscellaneous Notes.]—*Ochr. Rost.* **13** no. 3–4 pp. 139–151, 2 figs. Prague, 1933. [Recd. March 1934.]

These notes include a brief communication by V. Vielwerth on a severe outbreak of *Macrosiphum onobrychis*, Boy. (*ulmariae*, auct.) that occurred in April on lucerne in several districts in southern Slovakia. Its early appearance was probably due to warm weather in March ; in other years it has occurred considerably later in the spring, or in summer. It may be controlled by tobacco dust applied after dew or rain.

The remaining notes are by C. Blattný, and deal with insects recorded in various parts of Bohemia. Observations have shown that females of *Cheimatobia brumata*, L., may be carried to the crowns of the trees by males during pairing [but *cf. R.A.E.*, A **20** 372]. Adhesive bands cannot, therefore, be considered sufficient to protect fruit trees. *Aporia crataegi*, L., appeared in southern Bohemia in June 1932 for the first time since 1910, the butterflies being carried there by the east wind from Slovakia and Moravia, whither they had spread as a result of a severe outbreak in Ruthenia. Larvae and pupae were found in southern Bohemia in the following year.

In the last few years, outbreaks of the Cecidomyiid, *Lasioptera rubi*, Heeg., and the Cynipid, *Diastrophus rubi*, Htg., have occurred on cultivated raspberries, both species being often found on the same plant. The best developed canes and primary shoots are more readily attacked than the secondary side shoots. Infested canes and shoots are stunted and become very brittle, the bark cracks and the fruits dry up. Destroying the infested canes proved to be an effective control measure.

Observations in an acacia [*Robinia*] grove severely infested with the plum scale, *Lecanium coryli*, L. [which the author considers the correct name for the species commonly called *L. corni*, Bch.] showed that the larvae may hibernate away from the trees. In the first half of April 1933, they were numerous under stones some 32 ft. from the crowns of the trees, and many were crawling up the trunks. Adhesive bands would therefore be of value as a supplementary measure of control.

Empoasca (*Chlorita*) *flavescens*, F., which occurred in great numbers on celery in hot-beds, was associated with a severe outbreak of mosaic [*cf.* **20** 480], which has not before been recorded on celery in Czechoslovakia. The infected plants had discoloured leaves and were stunted in growth. Experiments in transmitting the disease to celeriac gave negative results. *Sitotroga cerealella*, Ol., was observed in the second half of July 1933 feeding on the unripe grains of wheat at the edges of the fields. The infestation was probably the result of dry weather. *Ephestia elutella*, Hb., caused serious damage in 1932 and 1933 to old stored hops lying in heaps or packed in sacks; hops pressed in bales were not attacked. The larvae destroyed the stems and leaves, causing the heads to decay; in this way about 250 tons of hops were rendered worthless. Pupation took place among the sacks. The infestation was more severe in dry and warm sheds, especially where the hops were stored on a wooden floor.

Kalandra (A.) & Rozsypal (J.). **Einige Bemerkungen über *Lecanium coryli* L. auf Eschen und über die auf demselben parasitierenden Pilze.** [A few Notes on the Plum Scale on Ash Trees and on Fungi parasitising it. (*In Czech.*)]—*Ochr. Rost.* **13** no. 5–6 pp. 153–176, 1 fig., 1 map, 2 pls., 35 refs. Prague, 1933. (With a Summary in German.) [Recd. March 1934.]

Since 1922, *Lecanium coryli*, L., which is considered the correct name for the species commonly called *L. corni*, Bch. [*cf. R.A.E.*, A **20** 480], has become very abundant in Moravia on plum, acacia [*Robinia*], and especially ash (*Fraxinus excelsior* and *F. alba*). Observations showed that, wherever ash was attacked, other trees were also infested, and a table is given indicating the food-plants in various localities, the stages,

sex and abundance of the scale on them, and the number of generations that developed. In experiments to ascertain the adaptability of this Coccid to different food-plants, second-instar larvae from *Fraxinus* were placed on the following trees: hazel (*Corylus avellana*), apricot, gooseberry, flowering currant (*Ribes aureum*), quince, *Sorbus aucuparia* var. *lutea*, rose, *Gleditschia triacanthos*, syringa (*Philadelphus coronarius*), *Lonicera tatarica*, red currant, *Robinia pseudacacia* and *Tilia cordata* (*parvifolia*). On all these the larvae hibernated, and the resulting females reached maturity and oviposited, except those on lime (*T. cordata*), which soon died without ovipositing. Development was particularly successful on the first nine plants and on peach in a greenhouse. In the second year, however, the offspring of these females reached maturity only on quince, apricot, peach and hazel, and in the third and following years the scale only maintained itself on peach and hazel. In mixed stands of ash, the cultivation of trees on which the larvae feed but die before reaching maturity helps to reduce infestation. Oak, birch, beech, alder and lime are biologically unsuitable for the development of the Coccid. Felling and removing severely infested trees or branches is an effective remedial measure, since the feeding larvae cannot migrate. Many of the overwintered larvae infesting annual plants, or those that have crawled from the litter on the soil to unsuitable food-plants, die in the course of the spring.

Natural enemies observed were the predators, *Coccinella septempunctata*, L., *Adalia bipunctata*, L., *Exochomus quadripustulatus*, L., *Anthribus nebulosus*, Küst., and *Leucopis* sp., and the parasites, *Blastothrix sericea*, Dalm., *Aphycus punctipes*, Dalm., *Phaenodiscus aeneus*, Dalm. (which was itself attacked by *Cerapterocerus mirabilis*, Westw.) and *Coccophagus scutellaris*, Dalm., and especially two entomogenous fungi, *Cordyceps pistillariaeformis* and *Cephalosporium lecanii*, which are described. *Cordyceps* infests mature or almost mature females starting to oviposit, or larvae about to become adult females, while the shields are still soft, whereas *Cephalosporium* chiefly attacks larvae in the autumn and spring, as well as young mature females. The scales probably become infested with either fungus through settling on spots where the spores are present. In experiments in which young females of *L. coryli* were brushed or sprayed with a suspension of the spores of *C. lecanii*, a rather low percentage became infested. Under field conditions, however, this treatment was unsuccessful.

These two fungi practically eliminated the scale in certain ash forests that are flooded nearly every year, their development being favoured by the resulting humidity. With the decrease in the numbers of the scales, the fungi also became much less abundant, especially *Cordyceps*, which was attacked by numerous mites, including a Tyroglyphid, *Histiogaster* sp.; great numbers of this species were found in the autumn of 1932 under the scales of females of *L. coryli* feeding on the fungus.

MAGERSTEIN (Č.). **Znetvořeni hrušek poškozením plodomorkou hruškovou** (*Contarinia* (*Diplosis*) *pirivora*). [Deformation of Pears due to Attack by *C. pyrivora*.]—*Ochr. Rost.* **13** no. 5–6 pp. 185–187, 1 fig. Prague, 1933. [Recd. March 1934.]

In the summer of 1933, pears in north-eastern Moravia were severely infested with the Cecidomyiid, *Contarinia pyrivora*, Riley. Fruits of the early varieties were hollowed out and eventually turned black and dropped to the ground. Those of the late varieties developed more or

less normally, but did not reach full size and contained no seeds. On the remains of the calyx was a gall measuring 5–12 mm. in height and 7–15 mm. in diameter, which contained the frass of the larvae. It is suggested that unfavourable weather had probably killed the larvae and that the fruit had continued to develop in this abnormal way.

Gróf (B.). **Die Rübenrüsselkäfer in Ungarn.** [The Beet Weevils in Hungary.]—*Zuckerrübenbau* **14** no. 3 p. 37, 1932. (Abstr. in *Ochr. Rost.* **13** no. 5–6 p. 189. Prague, 1933. [Recd. March 1934.])

In Hungary, damage to beet by weevils has considerably increased in recent years, the most important being *Bothynoderes* (*Cleonus*) *punctiventris*, Germ., and *Otiorrhynchus ligustici*, L. Notes are given on their bionomics and control. In spraying tests, barium chloride was more effective than arsenicals, but scorched the beet [*cf. R.A.E.*, A **21** 442]. Weevils concentrated at the bottom and on the walls of trap-trenches may be destroyed by applying a jet of flame fed through a hose with kerosene carried by the operator in a small tank. The nozzle of the hose is fastened to a pole, and the operator's arm is supported by a leather strap hanging round the neck.

Blattný [C.]. **Různé zprávy.** [Miscellaneous Notes.]—*Ochr. Rost.* **13** no. 5–6 pp. 190–195. Prague, 1933. [Recd. March 1934.]

Anuraphis tulipae, Boy., has been recorded from several districts in central Bohemia, causing such serious injury to carrots from June onwards that their cultivation has had to be abandoned in some localities. The aerial parts were not attacked, but the infested roots cracked and did not develop, and the plants soon died. No Aphids were found on neighbouring parsley plants, but a few occurred on wild carrots.

Various Halticids and Aphids have been often erroneously recorded as pests of hops. Of the former, *Psylliodes attenuata*, Koch, does attack only hops and hemp, the larvae feeding on the roots. Halticids occasionally found on hops, the infestation being always slight and of short duration, are *Chaetocnema concinna*, Marsh., *C. hortensis*, Geoff. (*aridella*, Payk.), *Phyllotreta flexuosa*, Illig., *P. nemorum*, L., *P. vittula*, Redt., and *Psylliodes affinis*, Payk. Of the Aphids, *Phorodon humuli*, Schr., is a permanent pest of hops, but *Aphis papaveris*, F., though often observed on them, only occurs for a short time and in small numbers.

Wiesmann (R.). **Ein Parasit der Kirschfliege** (*Rhagoletis cerasi* **L.).** [A Parasite of the Cherry Fruit-fly.]—*Mitt. schweiz. ent. Ges.* **15** no. 13 pp. 553–557, 1 pl., 5 refs. Berne, 15th December 1933. [Recd. April 1934.]

In June 1932, the author obtained 34 examples of an Ichneumonid, *Phygadeuon* [*wiesmanni* (see next paper)] from 138 pupae of *Rhagoletis cerasi*, L., collected in Switzerland from the ground beneath infested cherry trees [*R.A.E.*, A **21** 682]; in 1933, 24 per cent. of 206 pupae were parasitised by it. An illustrated description of this parasite is given. From 17th June onwards, both sexes were taken under the trees, many females having mature eggs. Captive adults lived up to 14 days. The full-grown larva hibernates in a cocoon inside the host puparium.

Sachtleben (H.). **Deutsche Parasiten der Kirschfruchtfliege.** [German Parasites of the Cherry Fruit-fly.]—*Arb. morph. tax. Ent. Berl.* **1** no. 1 pp. 76–82, 1 pl., 15 refs. Berlin, 5th March 1934.

No parasite of *Rhagoletis cerasi*, L. (cherry fruit-fly) was known until recently. In 1932 an Ichneumonid, here described as *Phygadeuon wiesmanni*, sp. n., was found in Switzerland [see preceding abstract]. This species has also been bred at Naumburg a.S. from *R. cerasi* and two other Trypetids. Other parasites of *R. cerasi* here described are the Braconid, *Opius rhagoletiicolus*, sp. n., the Ichneumonid, *Gelis bremeri*, Hbm., and the Diapriid, *Polypeza försteri*, Kieff., all from Naumburg.

Tomaszewski (W.). **Zur Taxonomie der Kohlfliegen** *Chortophila brassicae* **Bouché und** *Ch. floralis* **Fallen.** [A Contribution to the Taxonomy of the Cabbage Flies, *Phorbia brassicae* and *P. floralis*.] —*Arb. morph. tax. Ent. Berl.* **1** no. 1 pp. 60–66, 6 figs., 14 refs. Berlin, 5th March 1934.

In Sweden, *Phorbia* (*Chortophila*) *floralis*, Fall., is a much more serious pest of cruciferous plants than *P.* (*C.*) *brassicae*, Bch. [*R.A.E.*, A **21** 499], which is the more important in Germany. In view of the need for accurate identification of these species, details of the morphology of the larvae and male adults are described and compared. Reference is also made to characters of the female adults that are not constant but may serve to distinguish the species if sufficient material is available.

Thiem (H.). **Beiträge zur Epidemiologie und Bekämpfung der Kirschfruchtfliege** (*Rhagoletis cerasi* **L.**). [Contributions to the Epidemiology and Control of the Cherry Fruit-fly.]—*Arb. physiol. angew. Ent. Berl.* **1** no. 1 pp. 7–79, 12 figs., 8 pp. refs. Berlin, 5th March 1934.

In this detailed report, the data obtained in original investigations on *Rhagoletis cerasi*, L., in Germany are compared with information in the literature.

The following is based on the summary : The time of adult emergence is correlated with the nature of the soil. In flat, sandy districts development is more rapid and is completed sooner than in hilly ones with a clay soil. Where soil conditions are very varied, three applications of a poison-bait spray would not suffice to protect late-ripening varieties of cherry [*R.A.E.*, A **21** 376]. A few of the flies probably emerge in the year of pupation. More pupae hibernate for one winter only than for two. The distribution of the pupae in the ground depends on the activity of the larvae, the density of the soil and the power of heavy rain to wash them down into cracks. The majority were at a depth of less than $1\frac{3}{4}$ ins. [*cf.* **21** 682], indicating their great resistance to frost, moisture and heat. Four species of parasites were bred from the pupae [see above, p. 000]. Parasitism was heavier under *Lonicera* spp. than under cherry and heavier in sand or clay soil than in chalk soil.

The wild food-plants, excluding *Prunus* spp., are discussed in very great detail [**20** 454 ; **21** 375]. The infestation of *Lonicera tatarica* and *L. xylosteum* was independent of the presence of cherries. Other species that were heavily infested were *L. morrowi*, *L. iberica*, and *L. tatarica rubra*. *L. alpigena* and *L. coerulea* were slightly attacked,

and *L. caprifolium*, *L. diversifolia*, *L. nigra*, *L. orientalis*, *L. tibetica* and *L. ledebouri* not at all. The identity of the races on *Lonicera* and cherry was proved by cross-breeding and transfer experiments.

Infestation of sour cherry varies according to the variety. Wild species of *Prunus* slightly attacked were *P. cerasus*, *P. padus* and possibly *P. mahaleb*.

Superficial digging or ploughing does not effectively prevent adult emergence. Superficial watering with a weak (1·3 per cent.) tetrachlorethane-soap emulsion is recommended for the destruction of pupae beneath wild plants. For soil treatment under cherry, a tar distillate should be applied when the larvae are pupating. The fly cannot be permanently controlled unless direct measures are supplemented by the eradication of wild food-plants.

JANCKE (O.). **Der Erlenkäfer** (*Agelastica alni* **L.**) **als Kirschschädling.** [The Alder Beetle as a Pest of Cherry.]—*Arb. physiol. angew. Ent. Berl.* **1** no. 1 pp. 80–92, 4 figs., 12 refs. Berlin, 5th March 1934.

In May 1933, the foliage of about 300 young cherry trees in the Unstrut Valley was attacked by adults of the Galerucid, *Agelastica alni*, L., not previously recorded from this food-plant. Old cherry trees about 50 yards away were not attacked. The source of the infestation was a clear-felled area of alders, apparently cut down in 1931. The stumps had put forth shoots 3–5 feet long, the leaves of which were very heavily infested. A few young limes [*Tilia*] were attacked to some extent, and hornbeam [*Carpinus*] severely. In experiments, the trees most severely attacked by the adult beetles were alder, birch and hazel (*Corylus avellana*). Sweet cherry was the only fruit tree on which they fed. Larvae of all instars fed readily on apple, as well as on birch, alder and various other plants.

The eggs were laid close together in batches on the leaves, the number per female varying from 46 to 398. There was an average interval of 9 days between the batches, and oviposition extended over 10 weeks. The optimum conditions for incubation were 25°C. [77°F.] and 87–95 per cent. relative humidity.

Of various insecticides tested against the third-instar larvae and the adults, preparations of pyrethrum and of derris proved the best. The others were stomach poisons, of which only arsenicals were of any value.

SUBKLEW (W.). **Physiologisch-experimentelle Untersuchungen an einigen Elateriden** (*Agriotes obscurus* **L.,** *Agriotes lineatus* **L.,** *Corymbites tessellatus* **L. und** *Limonius* **spec.).** [Experimental Investigations on the Physiology of some Elaterids.]—*Z. Morph. Oekol. Tiere* **28** no. 2 pp. 184–228, 1 fig., 2 pp. refs. Berlin, 19th February 1934.

Field observations in Schleswig-Holstein, confirmed by laboratory studies, show that larvae of *Agriotes obscurus*, L., and *A. lineatus*, L., occur in soils with widely different pH reaction and structure, but their distribution is closely connected with the water content of the environment. Similar observations were made with regard to *Limonius* sp., of which there has recently been a serious outbreak on cabbage in one district. Eggs, larvae and pupae of *A. lineatus* and *Corymbites sjaelandicus*, Müll. (*tessellatus*, auct.) quickly died when exposed to air of under 98 per cent. relative humidity, though older larvae survived

longer than younger ones. The larvae of these two species proved to be greatly influenced by the osmotic pressure of the environment ; a solution containing as much as about 2 per cent. of salts is harmful, while 6–8 per cent. is definitely lethal. The harmful effect of different ions is not equal, the descending order of toxicity being K, NH_4, Na, Ca, Sr, Ba, Mg. In experiments with kainit [*cf. R.A.E.*, A **21** 531] in pure solution and combinations, these larvae preferred soil of high (about 80 per cent.) humidity, even though it contained a large amount of salts. In order to produce a 1·84 per cent. solution of salts (a concentration that, in laboratory tests, was only on the margin of toxicity) in saturated soil, it would be necessary to apply over 25,000 lb. of kainit to the acre, whereas dosages of over 700 lb. are rarely used in practice. The prospects of controlling wireworms in the field with kainit, therefore, appear unfavourable, but further work is necessary before a definite conclusion is reached.

Langenbuch (R.) & Subklew (W.). **Zur Frage der Drahtwurmbekämpfung mit Kalisalzen.** [On the Question of Wireworm Control with Potassium Salts.]—*NachrBl. dtsch. PflSchDienst* **14** no. 3 pp. 21–22, 2 refs. Berlin, March 1934.

In view of the conflicting results obtained by the authors in separate experiments as to the action of kainit on wireworms [see preceding abstract and *R.A.E.*, A **21** 531], joint studies were undertaken in 1913 at Kiel. The results show that larvae of *Agriotes obscurus*, L., from Hanover were injured by a 0·2 per cent. solution of potassium chloride (which was apparently the most active constituent of the kainit), whereas those of the same species or of *A. lineatus*, L., from Schleswig-Holstein were not.

Langenbuch (R.). **Ueber die Verbreitung von Erbsenwicklerarten in Deutschland.** [On the Distribution of Pea Tortricids in Germany.] *NachrBl. dtsch. PflSchDienst* **14** no. 3 p. 23, 1 fig. Berlin, March 1934.

Rearing of Tortricid larvae found infesting peas in all parts of Germany has shown that the predominant species is *Cydia* (*Laspeyresia*) *nigricana*, Steph. *C.* (*L.*) *dorsana*, F., is much less common, except perhaps in a few localities. *C.* (*L.*) *nebritana*, Treit., was not found [*cf. R.A.E.*, A **18** 664].

Die hauptsächlichsten starken Schäden an Gemüsepflanzen und Obstgewächsen im Jahre 1933. [The chief severe Injuries to Vegetables and Fruit Plants in 1933.]—*NachrBl. dtsch. PflSchDienst* **14** no. 3 pp. 26–29, 8 maps. Berlin, March 1934.

Records of insect pests from different localities in Germany form the greater part of this list.

Babel (A.). **Von der Obstmade.** [On the Larva of the Codling Moth.] —*Z. PflKrankh.* **44** no. 3 pp. 119–122, 5 figs. Stuttgart, 1934.

Observations in the Rhineland indicate that in years such as 1931, when warm weather causes the larvae of *Cydia pomonella*, L., to appear soon after blossoming and over a short period, they enter apples at the calyx, whereas in unfavourable years such as 1932 and 1933,

when they appear late and over a long period, the majority enter the fruits elsewhere. In favourable years, therefore, a calyx spray may afford protection, whereas in unfavourable years a cover spray 3–4 weeks after blossoming is necessary. In July and August 1932, instances were observed of almost full-grown larvae leaving apples and migrating to others, in which they made deep holes.

MALENOTTI (E.). **Esperienze contro i nemici del melo.** [Experiments against Apple Pests.]—*Italia agric.* **71** no. 1 pp. 21–38, 16 figs., 16 refs. Rome, January 1934.

From 3,546 cocoons of *Cydia pomonella*, L., collected in the Province of Verona in December 1932 and kept in cages, only 23 adults (0·9 per cent. of the total number) emerged during the period (12th April–4th May) when apple was in blossom, and these only because of dry, warm weather at the end of March, whereas 2,142 (81 per cent.) emerged from 16th May to 22nd June, and others continued to appear until 14th July [*cf. R.A.E.*, A **21** 372]. Sprays were accordingly applied on 23rd–24th May, and 2nd–3rd, 13th–14th and 23rd–24th June. Further (partial) applications were made on 5th–6th and 22nd July. The final spray must have served against the second (overwintering) generation, as pupae were found on 17th July, indicating that some adults of the first generation had already emerged. The 44 larvae and pupae collected on 17th July produced 18 adults between 22nd July and 7th August. Larvae were collected weekly from 31st July to 17th October, after which none was found. Adults of the first generation apparently ceased emerging very early in September, so that periodic removal of trap-bands has no practical value after August. A detailed account is given of the spraying work. Five applications of 3 lb. lead arsenate in 100 gals. Bordeaux mixture (used against apple scab) proved effective and economically justified.

The pear Tingid, *Stephanitis pyri*, F., appeared in such numbers as to defoliate many apple trees. A 5 per cent. lime-sulphur spray killed the nymphs rapidly and the adults after a week. The leaf-miner, *Leucoptera* (*Cemiostoma*) *scitella*, Zell., injured the foliage of several hundred apple trees. Lime-sulphur or other contact sprays are suggested against it.

VUILLET (J.). **A propos de la rosette de l'arachide : contrôle des pucerons par les insectes auxiliaires.**—*Rev. Bot. appl.* **14** no. 149, pp. 8–12, 9 refs. Paris, January 1934.

Since rosette disease of ground-nuts [*Arachis hypogaea*] in French West Africa usually appears about the end of August when the plants are in an advanced state of development [*R.A.E.*, A **22** 47], the author considers that the liberation of laboratory-bred individuals of *Cydonia vicina*, Muls., could not be effected early enough to check the rapid spread of the infection by *Aphis laburni*, Kalt., on which this Coccinellid is predacious [**20** 159]. He recommends the introduction into ground-nut fields of *Leptadenia lancifolia* and *Calotropis procera*, both of which grow wild throughout the year and serve as food-plants of *Macrosiphum* (*Siphonophora*) *leptadeniae*, Vuill., which is readily preyed upon by *C. vicina* [*cf.* **13** 391]. The Coccinellid could thus breed in the open and check the first colonies of *A. laburni* that appear on *Arachis*. Moreover, since *C. vicina* also preys on *A. sorghi*, Theo., on

Sorghum and *A. gossypii*, Glov., on cotton, the food-plants of *M. leptadeniae* should be introduced into fields of these crops too, especially as there are also several species of Syrphids predacious on all these Aphids.

Mayné (R.) & Ghesquière (J.). **Hémiptères nuisibles aux végétaux du Congo Belge.**—*Ann. Gembloux* **40** no. 1 reprint 41 pp., 10 pls., 11 figs. Brussels, January 1934.

An annotated list is given of 273 species of Rhynchota (the general habits of which are discussed with examples) recorded from more than 150 wild and cultivated plants, chiefly in the Belgian Congo, but including some observed by one of the authors in Angola and the islands in the Gulf of Guinea. The genera in each family are arranged alphabetically, and indices of food-plants and natural enemies are appended. Three new Aleurodids named by Ghesquière (p. 30), of which only the first two are (briefly) described, are: *Aleurolobus palmae*, on *Raphia* and oil palm (*Elaeis*); *A. vrijdaghi*, on coffee; and *Bemisia gossypiperda* var. *mosaicivectura*, which transmits a mosaic-like disease of cotton [*cf. R.A.E.*, A **19** 709] and mosaic of cassava and perhaps also of tobacco, cowpea (*Vigna sinensis*), *Datura*, egg-plant [*Solanum melongena*], *Capsicum* and ground-nuts [*Arachis hypogaea*], and produces temporary yellow spotting of cacao. The native food-plant of this *Bemisia* is *Ipomoea involucrata*.

Noble (N. S.). **The Citrus Gall Wasp.** (*Eurytoma fellis* **Gir.**)—*Agric. Gaz. N.S.W.* **44** pt. 6 pp. 465–469, 1 fig. Sydney, 1st June 1933.

Hymenoptera found in galls on *Citrus* in 1932 in the Grafton district, New South Wales, proved to be *Eurytoma fellis*, Gir., the Torymids, *Epimegastigmus brevivalvus*, Gir., *E. trisulcatus*, Gir., and *Epibootania nonvittata*, Gir., and a Braconid, *Megalyra* sp., here given in order of their abundance. Observations showed that *Eurytoma fellis* was responsible for the damage and that *Epimegastigmus* spp., were parasitic on it. This Eurytomid, which is apparently indigenous to Australia, occurs in the northern coastal region of New South Wales and in Queensland. The galls are produced by the oviposition of the females between the bark and the wood of the new twigs, or in thorns, fruit-stalks or petioles, and by the subsequent development of the larvae. They are particularly severe on wild lemons and thorny mandarins, though grape-fruit, oranges, mandarins and lemons are also subject to attack. On severely infested trees, the galls may extend for several feet on both sides of the twigs of the greater part of the spring growth. The tips of the twigs, beyond the galls, may continue to function for some time, and abnormal shoots frequently spring from the galls. Neglected trees appear knotted and gnarled within a few seasons, and their whole condition may be affected. Oviposition in the main stem may render young trees in the nursery completely useless. The degree of infestation may vary greatly in neighbouring plantations or even trees. The adults, which only live a few days, emerge in spring, chiefly during October–November, and pairing and oviposition continue until early December. The eggs hatch in 2–3 weeks, and the galls are usually first visible in late December. The larvae feed within the galls (which are fully developed in early winter) for 45–46 weeks, pupating in early spring. The adults eat their way out of the gall after 3–4 weeks. There is thus one generation a year.

The only satisfactory method of control appears to be the removal and destruction of the galls before the adults emerge. This could be effected between March and the end of August. Adults have emerged from galls kept dry for 2 months, and if cutting is left until spring, care must be taken to collect all galls from beneath the trees and burn them. In view of the scattered distribution of the commercial orchards in the Grafton district and the weak powers of flight of *E. fellis*, it appears probable that careful removal of the galls in winter would ensure freedom from infestation for several years.

Entomology.—*Rep. Waite agric. Res. Inst. 1925–32* pp. 54–66, 8 figs. Adelaide, 1934.

Much of this information on work carried out on pests of pastures, cereals and fruit trees in South Australia by the entomological division of the Waite Institute since its inception in 1929 has already been noticed. The Eupodid mites, *Halotydeus destructor*, Jack, and *Penthaleus bicolor*, Frogg., were only of local importance until the winter of 1933, when they caused considerable damage to tomatos in greenhouses and to leguminous crops, such as peas, on the Adelaide plains and in the south-eastern part of the State. They were also injurious to most cultivated annuals. *H. destructor* [*cf. R.A.E.*, A **15** 350 ; etc.] is the commoner and more destructive. Studies showed that the eggs hatch in 6 days at 59°F. and that large numbers are destroyed by excessive moisture. A single female lays at least 50, among weeds, from which infestation spreads to cultivated plants. The feeding of the mites often considerably affects the assimilatory areas, and this, together with the loss of water, may cause the plant to wilt and die. Prolonged but less severe attack may stunt the growth considerably.

An outbreak of *Myzus persicae*, Sulz., the seasonal history of which is outlined, occurred on peach during the spring of 1928. Observations show that in the South Australian climate the eggs hatch freely during the winter months and the Aphids from them then perish. Outbreaks are probably the result of some special combination of weather conditions that prevents a considerable percentage from hatching until about the time when the buds begin to open in spring. The cost of applying winter sprays of tar distillate [*cf.* **22** 42 ; etc.] would probably not be justified every year in all districts.

Cunningham (G. H.). **Orchard Sprays in New Zealand. VII. Combination Sprays.**—*N.Z. J. Agric.* **48** no. 1 pp. 1–12, 31 refs. Wellington, 20th January 1934.

In this paper, which is one of a series [*cf. R.A.E.*, A **21** 645, etc.], combined sprays containing lime-sulphur, lead arsenate, Bordeaux mixture, nicotine or nicotine sulphate, colloidal sulphur, or petroleum oils as one constituent are discussed, including those containing three or four constituents.

Muggeridge (J.). **Methods of Cyaniding in Glasshouses. Economical Control of White-fly.**—*N.Z. J. Agric.* **48** no. 1 pp. 47–48. Wellington, 20th January 1934.

The use of hydrocyanic acid gas in greenhouses against whiteflies [*Trialeurodes vaporariorum*, Westw.] in New Zealand is discussed [*cf.*

R.A.E., A **18** 600]. The amount of gas from $\frac{1}{5}$–$\frac{1}{4}$ oz. sodium cyanide to every 1,000 cu. ft. will kill all the adults and 90 per cent. of the scale stages but not the eggs, so that the process must be repeated after 2 weeks in warm or 3 in cool weather. Plants with delicate foliage such as tomato may be injured by concentrations sufficient to kill the scale stages unless their roots have been kept dry for a considerable time before fumigation. Cucumber and allied succulent plants that require constant water cannot withstand a greater concentration of gas than that generated from $\frac{1}{8}$ oz. sodium cyanide to 1,000 cu. ft., which kills a high percentage of the adults but not the other stages. The method of generating the gas by dropping the sodium cyanide into dilute sulphuric acid is being largely superseded by that of using it as a dry powder mixed with 3 parts by weight of sodium bicarbonate. The mixture is distributed along the paths of the houses, which must be dry. The slow generation of the gas facilitates the use of this method. The mixture should not be touched with the hands. The houses should be fumigated at dusk, kept closed during the night and well ventilated in the morning. They may be heated during fumigation if necessary.

Russell (T. A.). **Report of the Plant Pathologist, 1933.**—*Rep. Dep. Agric. Bermuda 1933* pp. 28–36. [Hamilton, 1934.]

The spread of *Comstockiella sabalis*, Comst., on palmetto [*Sabal*] in the areas in Bermuda where it is already established was greater during 1933 than since its discovery in 1921, and new centres of infestation were found at some distance from the old ones. *Aphytis* (*Aphelinus*) *fuscipennis*, How., *A. mytilaspidis*, LeB., *Encarsia portoricensis*, How., and *Aleurodothrips fasciapennis*, Frankl., were among the natural enemies taken from infested trees, most of them being of local distribution with the exception of the first, which was found in all areas, sometimes in great abundance. Observations indicate that spraying with a medium-heavy lubricating oil emulsion should be repeated after 6 weeks, as the eggs are not always killed by the spray.

Potato tubers infested with *Phthorimaea operculella*, Zell., which was first observed during the latter half of April, were usually of a greenish colour, indicating that they had not been completely covered with soil; in one case, however, ovipositing moths had apparently penetrated the soil, possibly through cracks. Larvae of this Tineid caused much loss to tomatos, of which it is now considered the chief pest, by boring into the fruit, usually under the calyx. They also mined the leaves of egg-plant [*Solanum melongena*] and of *Nicotiana sanderae*, and were found in the leaves and berries of the weed, *S. nigrum*. The Ichneumonid parasite, *Angitia blackburni*, Cam., was common in the larvae. Tomato fruits were also damaged by Noctuids, including *Heliothis obsoleta*, F., and *Prodenia ornithogalli*, Gn., the larvae of which latter also devoured the tops of onions during the spring.

Unusually slight damage was caused by the Pyralid, *Hymenia fascialis*, Cram., which in 1932 completely destroyed beet sown in the autumn. The moths were abundant during the autumn on the common weeds, *Amarantus hybridus* and *Portulaca oleracea*. In experiments, the eggs were laid singly or in small clumps, chiefly on the lower surface of the leaves of beet seedlings but sometimes on the upper surface or the stem. One female deposited more than 200 in 10 days. At about 75°F., they hatched in 3 days. The larvae fed voraciously for 13 days on the lower surface of the leaves, binding them together to form a shelter, and

pupated in cocoons in the surface soil. The adults emerged after 13–15 days. Dusting with lead arsenate was slightly more effective than spraying with the same material or with derris.

Other pests observed were : *Phytometra brassicae*, Riley, and *Pieris rapae*, L., which caused severe damage to cabbage and kale early in the year, the latter being controlled by a fungus ; *Diaphania* (*Margaronia*) *hyalinata*, L., seriously injuring squash ; *D.* (*M.*) *nitidalis*, Stoll, on cucumber ; *Thrips tabaci*, Lind., on onion ; *Aphis gossypii*, Glov., which contributed to the spread of yellow-flat disease of lilies [*cf. R.A.E.*, A **17** 615] during part of the season ; the Dynastid, *Ligyrus tumulosus*, Burm., the larvae of which attacked lily bulbs in the soil ; *Taeniothrips simplex*, Morison, which destroyed gladiolus flowers in the spring and early summer, the measures recommended being the burning of heavily infested plants and the use of naphthalene flakes on bulbs stored over the summer ; *Pangaeus bilineatus*, Say, the punctures of which on strawberries were followed by rot ; the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.], the larvae of which were found in May in the pods of broad beans and in bananas that had ripened on the tree [*cf.* **16** 683] ; and *Icerya purchasi*, Comst., a severe attack of which on *Pittosporum* was effectively controlled by the Coccinellid, *Rodolia cardinalis*, Muls.

Kofoid (C. A.) Ed. **Termites and Termite Control. A Report to the Termite Investigations Committee.**—Med 8vo, xxv+734 pp., 1 pl., 182 figs., 9 pp. refs. Berkeley, Calif., Univ. Calif. Pr.; London, Camb. Univ. Pr., 1934. Price 22*s.* 6*d.*

In view of the increasing destructiveness of termites in the south-western United States from California to Texas, the Termite Investigations Committee was formed in 1927 (as stated in an introduction by A. A. Brown) to direct a comprehensive study of their bionomics and control on the Pacific Coast. This report, which is written in non-technical language, is the result of co-operation between those interested in the large-scale production and utilisation of wood and specialists in individual phases of the subject. It is divided into four main sections, entitled respectively : Termites and their Biology, Chemical Investigations, Termite Resistivity of Wood and Building Materials, and Prevention and Repair of Termite Damage.

The papers contained in the first section are : Biological Backgrounds of the Termite Problem, and Climatic Factors affecting the local Occurrence of Termites and their Geographical Distribution, both by C. A. Kofoid ; The Constitution and Development of the Termite Colony, The External Anatomy of Termites, A World View of Termites, The Termite Fauna of North America with special Reference to the United States, Habitat and Habit Types of Termites and their Economic Significance, The Desert Termites of the Genus *Amitermes*, Dry-wood Termites, their Classification and Distribution, The Southern and Mountain Dry-wood Termites, *Kalotermes* [*Calotermes*] *hubbardi* [Banks] and *Kalotermes marginipennis* [Latreille], The Desert Damp-wood Termite, *Paraneotermes* [*C.*] *simplicicornis* [Banks], Termites and growing Plants, The Termite Fauna of Mexico and its Economic Significance, and The Termite Fauna of the Philippine Islands and its Economic Significance, all by S. F. Light ; American Subterranean Termites, their Classification and Distribution, and The Desert Subterranean Termite, *Heterotermes aureus* [Snyder], both by

Light and A. L. Pickens ; The Distribution and Biology of the Common Dry-wood Termite, *Kalotermes minor* [Hagen], I. Distribution and Means of Identification, by Light, II. Life History of *Kalotermes minor*, by P. A. Harvey ; Economic Significance of the Common Dry-wood Termite, I. General Economic Significance, by Light, II. Colonization of the Common Dry-wood Termite in wooden Structures, by Harvey ; The Biology and Economic Significance of the Western Subterranean Termite, *Reticulitermes hesperus* [Banks], and The Barren-lands Subterranean Termite, *Reticulitermes tibialis* [Banks], by Pickens ; Some Factors limiting the Distribution of Termites, by O. L. Williams ; The Internal Anatomy of Termites and the Histology of the Digestive Tract, by H. J. Child ; Protozoa in Termites, by H. Kirby, jr. ; Hydrogen-ion Concentration in the Termite Intestine, by M. Randall and T. C. Doody ; The Association of Termites and Fungi, by E. C. Hendee ; American Subterranean Termites other than those of the Pacific Coast, The Dry-wood Termites of eastern and southern United States, and The Termite Fauna of the West Indies and its Economic Significance, by T. E. Snyder ; The Termite Fauna of the Canal Zone, Panama, and its Economic Significance, by Snyder and J. Zetek ; The Damp-wood Termites of western United States, Genus *Zootermopsis* (formerly *Termopsis*), by G. B. Castle ; The Termites of Hawaii, their Economic Significance and Control, and the Distribution of Termites by Commerce, by E. M. Ehrhorn ; and Wood-boring Insects whose Appearance or Workings resemble those of Termites, by E. C. Van Dyke.

The papers contained in the second section are : The Toxicity of Chemicals to Termites, by Randall, W. B. Herms and Doody ; Wood Preservatives and Protective Treatments, Commercial Proprietary Preservatives, Treatments with Poison Dusts, and Ground Treatments, by Randall and Doody ; Paints and Termite Damage, and Treatment by Fumigation, by Randall, Doody and B. Weidenbaum ; Tests of Wood Preservatives to prevent Termite Attack, conducted by the Bureau of Entomology, U.S. Department of Agriculture, by Snyder and Zetek ; and The Toxicity of various Poisonous Dusts, by Kofoid and Williams.

Those in the third section are : Seasonal Changes in Wood in Relation to Susceptibility to Attack by Fungi and Termites, by Kofoid ; A Standard Biological Method of testing the Termite Resistivity of Cellulose-containing Materials, by Kofoid and E. E. Bowe ; Distribution of Extractive in Redwood [*Sequoia sempervirens*], its Relation to Durability, and The Crystalline Coloring Compounds in Redwood Extract, both by E. C. Sherrard and E. F. Kurth ; and Wood Preference Tests, and Tests on Wallboards and Insulating Materials, by Williams.

Those in the fourth section are : General Recommendations for the Control of Termite Damage, by Brown, Herms, A. C. Horner, J. W. Kelly, Kofoid, Light and Randall ; Inspection and Maintenance, by Kofoid and G. E. Chase ; Buildings, by Horner, Rowe, W. Putnam and Chase ; An Audio-amplifying System for Termite Detection, by R. C. Barton ; Power, Telephone, and Telegraph Lines, by Barton, H. Michener and W. H. Hampton (with two appendices) ; Railroad Structures, by W. H. Kirkbride ; Miscellaneous exposed Structures, by Horner and G. A. Rader ; Lumber Storage Piles, I. Recommendations for preventing and repairing Damage, by Horner and Bowe, and II. Experimental Studies of Methods for the Protection of new Lumber from colonizing Dry-wood Termites, by Williams ; Legislative Action,

I. Municipal Laws, by Bowe, II. State Laws, by W. C. Jacobsen and A. C. Browne, III. Federal Quarantine Laws, by Snyder ; Prevention of Wood Decay in Buildings, by R. H. Colley ; and Termites as a Factor in Earthquake Damage, by W. T. Steilberg.

Summary for 1933.—*Insect Pest Surv. Bull.* **13** no. 10 pp. 325–340. 8 maps, multigraph. Washington, D.C., U.S. Dep. Agric., Bur, Ent. [1934.]

This summary contains notes on insects injurious in the United States during 1933. The distribution of the following is indicated by maps : grasshoppers, of which *Melanoplus mexicanus*, Sauss., predominates in the most severely infested areas, which now include northern Montana [*R.A.E.*, A 21 649] and north-central and north-eastern Wyoming ; *Blissus leucopterus*, Say, which will probably be very abundant in 1934, at least from Missouri to Ohio ; *Mayetiola* (*Phytophaga*) *destructor*, Say, attack by which on wheat in the autumn was light over the greater part of the winter-wheat area, owing to the comparatively small numbers of pupae aestivating in the stubble and to the fact that shortage of moisture affected its autumn activity, reduced the growth of self-sown wheat and caused a delay in the sowing of the new crop ; *Elasmopalpus lignosellus*, Zell., which was particularly injurious to maize, 70–100 per cent. of the late-planted crop being broken by wind owing to infestation in northern Florida and half the crop being destroyed by this borer in association with *Diatraea crambidoides*, Grote, in some localities in Georgia ; *Tibicen* (*Magicicada*) *septemdecim tredecim*, Riley, of which brood XIX, the largest of the 13-year ones, was numerous throughout the greater part of its range ; *Popillia japonica*, Newm., which was considerably less abundant than in 1932 [*cf.* **21** 335] in the areas longest infested ; and *Anomala orientalis*, Waterh., and *Aserica* (*Autoserica*) *castanea*, Arrow, which were found together in South Carolina.

Probably the heaviest population of *Cydia* (*Carpocapsa*) *pomonella*, L., on record has accumulated on apple in the Pacific Northwest owing to the neglect of about 5 per cent. of the orchards, and the worst infestation for 20 years was recorded from Illinois. *Aspidiotus perniciosus*, Comst. (San José scale) suffered a high mortality in the winter, but was more injurious in Georgia than for the last 5 years. New records were established for *Epilachna corrupta*, Muls. (Mexican bean beetle), which spread appreciably southwards for the first time since its introduction into north-central Alabama in about 1919 [*cf.* **9** 33] ; *Listroderes costirostris*, Schönh. (*obliquus*, Gyll.) (vegetable weevil), which was discovered in South Carolina in the middle of March, this being the most north-eastern record ; *Phthorimaea* (*Gnorimoschema*) *lycopersicella*, Busck (tomato pinworm), which was collected in Virginia on tomatos in a greenhouse ; *Taeniothrips gladioli*, Moult. & Stnw. (gladiolus thrips), which was found in Wisconsin, North Dakota, Colorado and Iowa, in which last State a few individuals had been collected in 1932 ; *Platynota stultana*, Wlsm., which attacked the new growth on about 15 per cent. of the rose plants in a greenhouse in Virginia [**22** 108] ; and *Sitona cylindricollis*, Fhs., not previously recorded from America, which caused such serious injury to young sweet clover [*Melilotus*] in Vermont as to necessitate replanting and was also found in New York, Connecticut and Massachusetts.

Swezey (O. H.). **Summary of Insect Conditions in Hawaii for 1933.**—*Insect Pest Surv. Bull.* **13** no. 10 pp. 340–341, multigraph. Washington, D.C., U.S. Dep. Agric., Bur. Ent. [1934.]

Insects causing damage in Hawaii during 1933 and not already noticed [*R.A.E.*, A **21** 492; **22** 137] include: *Heliothis obsoleta*, F., which attacked green maize, hardly an ear escaping injury; *Taeniothrips gladioli*, Moult. & Stnw., which caused very severe damage to gladiolus; and the Capsid, *Pycnoderes quadrimaculatus*, Guér. [*cf.* **19** 470], which was injurious to string beans. An outbreak of *Lamprosema* (*Omiodes*) *blackburni*, Butl. (coconut leaf-roller) occurred on young coconut palms in Honolulu after a lapse of 5–6 years, but was controlled by parasites, particularly *Cremastus flavo-orbitalis*, Cam. (*hymeniae*, Vier) [*cf.* **18** 11]. *Anthonomus eugenii*, Cano (pepper weevil) was found widely spread in Oahu, attacking various garden peppers [*Capsicum*] and the fruits of egg-plant [*Solanum melongena*] and *S. nigrum*.

Uichanco (L. B.) & Capco (S. R.). **Effect of various Methods of Storing Corn on the Degree of Damage due to Weevils.**—*Philipp. Agric.* **22** no. 9 pp. 653–672, 3 figs., 11 refs. Laguna, P.I., February 1934.

Investigations were undertaken from August 1931 to May 1933 in the Philippines, to determine how far maize may be protected from weevils by storing it without removing the husks and stigmas [*cf. R.A.E.*, A **7** 3, 409]. *Calandra* (*Calendra*) *oryzae*, L., which is responsible for over 95 per cent. of the insect damage to stored maize, was the only pest considered, as measures for its control would be equally effective against other insects, 11 of which occurred after considerable damage had been caused by it. Chalcidoid parasites were not observed until after the injury had become fairly far advanced and are not therefore considered of great importance. Under conditions simulating, so far as possible, those on farms or in store-rooms, with an average temperature of 28·28°C. [82·9°F.] and a relative humidity of 72·9 per cent., the degree of infestation appeared to be determined chiefly by the moisture-content of the grains.

The following is mostly taken from the authors' summary: In grains from ripe, freshly harvested ears of the rainy-season crop, the moisture content averages 27·53 per cent. In summer, it was reduced to a constant weight of about 8·5 per cent. in 32 and 28 days when ears with and without husks, respectively, were dried by the sun on a cement floor. Practically the same results were obtained by drying ears without husks in an oven at a maximum of 48°C. [118·4°F.] intermittently to simulate roughly the lengths of daily exposure to the sun. This temperature approximates to that lethal to the weevil [*cf.* **8** 180]. The temperature within seeds in ears exposed to the sun was not determined, but the reduction in moisture-content below the minimum (10 per cent.) for *C. oryzae* would probably render them free from infestation if outside moisture were excluded. However, sun-dried grains became infested within 6 weeks of storage, indicating a rise in the moisture content; an average of 12·19 to 12·88 per cent. was recorded after 7 months, which probably represents the equilibrium under the conditions of the experiments. Infestation of undried ears without husks about 5 weeks after harvest was about 1 per cent. in the top layer of those piled on a concrete floor, where there was a free circulation of air, and about 5 per cent. in those stored in sacks.

On sun-dried ears after about 7 months' storage, the percentage of kernels infested by *C. oryzae* averaged 17·95 for those with the husk removed, 10·07 for selected ears with full, tight-fitting husks and stigmas, 12·36 for unselected but undamaged ones, and 23·16 for imperfect ears ; it was highest (30·78 per cent.) on undried ears, even with the husk and stigmas intact. Thus, the grain is protected by the husks and stigmas provided that they are not imperfect or broken and that the ears are sun-dried before storage. Limited tests appeared to show that ears hung on racks (the method of storage practised by the natives for seed maize) were less severely infested when kept in the shade for the greater part of the day than when exposed throughout the day to the sun.

Hoskins (W. M.). **The Penetration of Insecticidal Oils into porous Solids.**—*Hilgardia* **8** no. 2 pp. 49–82, 6 figs., 25 refs. Berkeley, Calif., November 1933. [Recd. March 1934.]

It is pointed out that the practical effectiveness of contact insecticides applied alone or in combined sprays against pests hibernating in cracks and cavities in the bark of trees and bushes depends not only on their toxicity but also on their powers of penetration.

The following is substantially the author's summary : The rate of penetration of liquids into a porous solid was shown to be controlled by the average radius of the pores as well as by the penetrativity of the liquid, which is a function of its surface tension and absolute viscosity. A standard method of studying this rate was employed, in which strips of paper, deadening felt or bark of various trees or grapevines were dipped into oils and other liquids at the bottom of test tubes. Mineral oils followed the theoretical behaviour, but very volatile or reactive materials spread less rapidly than predicted. The solvent action of light oils on the resin in the bark decreased the rate of penetration. For a wide variety of oils, the penetrativity gave a measure of the relative rate of entry, and from graphs of spread, penetrativity and time, the relative ease of entrance into various solids could be determined. Data on surface tension, absolute and Saybolt viscosities, density, unsulphonatable residue, volatility and penetrativity are given, together with details of the methods of determination. Solutions containing 5–10 per cent. of a very fluid substance, such as kerosene, spread somewhat faster than was calculated from their penetrativities, owing to the separation of their components.

The total spread of known volumes of liquids through the same solids was studied by adding the liquids to strips either hung in closed test-tubes or in the open air. As viscosity controls the time until maximum spreading is attained, opportunity for evaporation and reaction with the air increases as the viscosity becomes greater. The most highly refined oils spread most both in the open and in closed containers. Increasing the volume of oil gave spreads less than proportionate to the volumes used, and the addition of more oil after spreading had ceased resulted in little further spread. Addition to the oils of fluids such as kerosene increased the total spread when evaporation was prevented but decreased it in the open. The rate of spread and the total spread were decreased by moistening the strips. The difficulty of applying enough oil in aqueous emulsions is discussed. Preliminary field experiments confirmed the necessity for oils of fairly high refinement, low viscosity and low volatility, so far as these properties are mutually compatible.

WILLIAMS (C. B.). **The Cotton Stainer Problem.**—*Emp. Cott. Gr. Rev.* **11** no. 2 pp. 99–110. London, April 1934.

The author briefly discusses the economic importance of *Dysdercus* on cotton, the nature of the injury caused, the distribution of the species chiefly concerned, their relation to the fungi and bacteria that cause boll-rots, the influence of climatic conditions, natural enemies (which are few and of little importance) and alternative food-plants, and the value of various control measures.

MOUTIA (L. A.). **The Sugar-cane Moth Borers in Mauritius.**—*Bull. ent. Res.* **25** pt. 1 pp. 33–45, 1 pl., 2 refs. London, March 1934.

Observations in 1928-32 on the local and seasonal incidence on sugar-cane in Mauritius [*cf. R.A.E.*, A **5** 440] of *Diatraea venosata*, Wlk. (spotted borer), which has become a serious pest, and *Sesamia vuteria*, Stoll (pink borer), and *Eucosma* (*Grapholita*) *schistaceana*, Sn. (white borer), both of which have become of minor importance, showed that very little damage is caused at high elevations, where temperature is low and rainfall abundant. *D. venosata* is common on the coastal belt during the cold dry season (April–July), whereas *S. vuteria* is abundant at medium and low altitudes during the hot rainy season (December–April), when sporadic outbreaks of *E. schistaceana* may occur in various parts of the Island. The eggs, larvae and pupae of the three moths are briefly described.

D. venosata attacks mature as well as young canes. The egg-stage lasts 7–9 days, the larval 25–30 and the pupal 15–25. The moths hide during the day among dry leaves and do not fly long distances. The eggs, of which one female may deposit from 150 to 200, are laid in batches of 10–30, arranged in two imbricated rows on the leaves or stem. The young larvae first attack the unopened leaves and then bore into the part of the stem beneath the sheaths; one larva may injure several stems. Pupation takes place outside the stem, generally between dried leaves.

S. vuteria attacks only young canes and shoots. The eggs, which are more often deposited under the leaf-sheaths of various grasses than on the canes, are arranged in two or three contiguous rows and hatch in 8–10 days. The larvae migrate to sugar-canes, where they tunnel in the central part of several stems successively, causing subsequent wilting. After 30–40 days, they pupate in cocoons, the pupal stage lasting 12–15 days. The adults avoid sunlight and hide among straw, etc., in the fields. This species and *D. venosata* also attack maize and various grasses.

The egg-stage of *E. schistaceana* lasts 5–7 days, the larval 25–30 and the pupal 10–12. The eggs are laid singly or in pairs on the leaves or stem of the young shoots, usually as soon as they sprout from the soil. The larva crawls down the plant and enters the underground portion of the shoot. Later it mines an ascending spiral gallery to the central part of the stalk, causing the whole shoot to wilt. It pupates in a cocoon at the exit of the gallery.

The egg-parasites found in Mauritius were *Trichogramma australicum*, Gir., the life-cycle of which is completed in 6–8 days in summer, and *Telenomus* (*Prophanurus*) *alecto*, Cwfd., which develops in 14–16 days. *Trichogramma* attacked all the three borers, the percentage of parasitism of *D. venosata* in severely infested localities sometimes reaching 75–90. *Telenomus* attacked *S. vuteria*, 60 per cent. of the eggs being

sometimes parasitised, and to a less extent *D. venosata*. No parasites of the larvae of *E. schistaceana* were observed. Those of *D. venosata* were attacked by *Apanteles flavipes*, Cam. (*simplicis*, Vier.), 60–75 cocoons of the parasite occurring on one host larva, and by *Henicospilus antankarus*, Sauss., and *Stauropoctonus* (*Ophion*) *mauritii*, Sauss., both of which also parasitised *S. vuteria*. The percentage of borers parasitised by *H. antankarus* reached 60 from January to April and ranged from 0 to 15 in other months.

The economic importance of *D. venosata* is discussed ; the numbers of larvae per acre varied between 1,600 and 35,000, with an average of 15,600, and in certain localities 60–70 per cent. of the canes were attacked, with a mean of 30 per cent. for the whole Island. The sugar content of infested canes was decreased by 16 per cent.

The various methods of control used in Mauritius for the last 15–20 years are discussed ; they include hand-collection and destruction of larvae ; the use of maize as a trap-plant ; the destruction of grasses and weeds harbouring the borers ; the rotation of crops ; and in the case of *D. venosata* the destruction of larvae in the tops to be planted by immersing these in cold water for 72 hours, or in hot water at 50–51° C. [122–123·8°F.] for 2 to 2½ hours, or at 52°C. [125·6°F.] for 30 minutes, or in saturated lime-water for 8 hours.

Miles (M.) & Miles (H. W.). **Studies of the Willow-shoot Moth, *Depressaria conterminella*, Zell.**—*Bull. ent. Res.* **25** pt. 1 pp. 47–53, 1 pl., 1 ref. London, March 1934.

All stages are described of *Depressaria conterminella*, Zell., an important pest of basket willow (*Salix viminalis*) in Lancashire and Cheshire. The eggs are laid during June and July and begin to hatch early in the following April. In the laboratory, they were deposited in crevices in the bark of willow stocks near the level of the soil. The young larvae migrate to the buds of the willows and tunnel into them through the young leaves ; later they web together the outer leaves at the tips of the shoots and eat out the terminal buds. In captivity, each larva destroyed 3–4 shoots. In the field, injury becomes apparent only when the willow rods attain a length of 1–3 feet ; on heavily infested trees, more than half the rods may be rendered valueless owing to the destruction of the growing point. The larval stage lasted less than 5 weeks in the laboratory and 6 under natural conditions. No parasites of the larvae were found. Pupation takes place in cocoons below the surface of the soil, or occasionally (in captivity) under dead leaves. The adults emerge after about 3 weeks and are on the wing in June and July. In captivity, they lived 8–12 days. They were not easily disturbed and spent the day on the surface of the soil and about the willow stocks.

Winter spraying of the stocks with oil emulsion or 7 per cent. tar distillate to destroy the eggs proved too expensive. Burning waste hay over the rows of willows during the dormant season reduced infestation from 36 to 6 per cent. in one field, and from 34 to 8 per cent. in another. Though fewer shoots were produced by the treated stocks and their growth was retarded, the increase in the number of straight rods compensated for the lighter crop. Cutting the rods 7–14 days after the buds open should remove many of the larvae, and numbers of those that hatch later will probably starve before the development of basal shoots ; in field experiments in which the rods were cut early in May

instead of during December–March, infestation was reduced from 40 to under 5 per cent.

The larvae of other moths were also found injuring the tips of the willow rods, though none was sufficiently numerous to be of economic importance. Of these, *Cheimatobia brumata*, L., was abundant on *Salix viminalis* during May and June. Larvae of the Noctuid, *Orthosia lota*, Cl., fed in cocoons, generally in the tips of the shoots. Apparently full-grown larvae of *Depressaria ocellana*, F., were found on 15th August on *S. purpurea*, and one adult was reared from *S. viminalis* ; the larvae severed the stem just below the terminal bud, pupating on the feeding site, and the moths emerged in September. Tortricids attacking the tips of shoots of *S. viminalis* included *Tortrix* (*Pandemis*) *corylana*, F., *T.* (*P.*) *heparana*, Schiff., *T.* (*P.*) *cinnamomeana*, Tr., *Peronea hastiana*, L., *Argyroploce micana*, Hb., and *Cnephasia pascuana*, Hb. Dwarf sallows were severely infested with larvae of *Anacampsis populella*, Cl., *Compsolechia temerella*, Zell., and *Gelechia sororculella*, Hb., which readily fed on cultivated willows in captivity.

ANANTANARAYANAN (K. P.). **On the Bionomics of a Eulophid (*Trichospilus pupivora*, Ferr.) a Natural Enemy of the Coconut Caterpillar (*Nephantis serinopa*, Meyr.) in South India.**—*Bull. ent. Res.* **25** pt. 1 pp. 55–61, 1 fig., 7 refs. London, March 1934.

In view of the considerable increase during the past ten years on the west coast of Madras of the coconut caterpillar, *Nephantis serinopa*, Meyr., a study was made of its Eulophid parasite, *Trichospilus pupivora*, Ferrière [*cf. R.A.E.*, A **15** 128 ; **19** 28], which develops in the host pupae and is abundant in several parts of Malabar during and immediately after the rains from July to February. All stages are briefly described. Under favourable conditions, the egg-stage occupies about 1 day, the larval 5–7, and the pupal 8–10 ; during wet weather in June the development period may extend over 20 days, and during the dry heat in March–April it may be reduced to about 15 days. Adults lived for 7 days, but not so long during hot dry weather ; feeding with sugar solution, yeast or dilute honey did not increase their longevity. In the laboratory, 22 generations were produced in continuous breeding throughout the year. Pairing sometimes occurs immediately on emergence, but probably it usually takes place within the host pupa. A female laid 100–200 eggs, with an average of 55 in each pupa ; the same pupa may be attacked by several females. The larvae devour the whole contents of the host and pupate within its empty pupal case. The parasite is hardly to be found during the hot dry weather from March to May, when the host pupae are also scarce, but under favourable conditions 75 per cent. parasitism has been obtained (in October and February). Repeated liberation in selected districts resulted in an appreciable control of *N. serinopa* in 16–24 months ; adult parasites have been found 3 miles from the place of liberation.

The parasites were readily reared in glass specimen tubes with holes in the corks closed with 90-mesh wire gauze, 5–10 being placed in each tube with 5–6 fresh host pupae. As dry, hot weather affects them and may kill the host pupae, a special breeding chamber (details of which are given) was constructed, in which lower temperature and higher humidity could be maintained by means of an ice pack. A temperature of 78–82°F. and relative humidity of 92–94 per cent. appear to be

favourable ; though a temperature of 85°F. accelerates the development, many of the larvae die for want of nutriment. More humid conditions induced the growth of fungi and bacteria.

The parasite has been successfully reared on pupae of *Spodoptera mauritia*, Boisd., *Prodenia litura*, F., *Xanthodes* (*Aconita*) *graellsi*, Feisth., *Cnaphalocrocis medinalis*, Gn., the Nymphalid, *Ergolis merione*, Cram., a Pyralid on grape-vine, and a Hesperiid on coconut. In the field, it has once been bred (at Calicut) from *Sylepta derogata*, F. (cotton leaf-roller).

MAXWELL-DARLING (R. C.). **The Solitary Phase of** *Schistocerca gregaria*, **Forsk., in north-eastern Kordofan (Anglo-Egyptian Sudan).**—*Bull. ent. Res.* **25** pt. 1 pp. 63–83, 5 figs., 2 pls. London, March 1934.

Two years' work in Kordofan has revealed the fact that the phases *dissocians* and *solitaria* of *Schistocerca gregaria*, Forsk., are established there and have persisted in the absence of invading swarms. Throughout the dry season, from September to June, the locusts exist as immature adults ; sexual maturation is induced by an increased atmospheric humidity, but egg-laying occurs only in moist soil, and hence can take place only after the rains. A loose sandy soil with a high percentage of coarse sand is selected for oviposition, and no eggs are laid in clay.

Of the three edaphic and climatic areas into which north-eastern Kordofan can be divided, the highest population of solitary locusts was found on the sandy hills (" gozes ") in the southern half of the area. This habitat appears to be artificially produced, the surface of the sand being made loose by agriculture ; no locusts are found on the uncultivated ground where the sand is firm. Observations have shown that adult solitary locusts may concentrate on certain food-plants if their distribution is patchy. On the " gozes," however, there is a continuous supply of food-plants throughout the year, and it seems unlikely that any concentrations of solitary locusts, leading to transformation into the gregarious phase, could occur there.

The second area is the " sisa " country situated to the north of the " gozes." Here the ground is harder, but there are some spots with loose sand, particularly along the dry beds of seasonal streamlets. The locust population is small and restricted to sandy places. Although a concentration of locusts can occur here, and was actually observed once, there is little likelihood of the " sisa " producing swarms, because of its scanty locust population.

In the northernmost area (the " gizzu "), the sand is loose and therefore suitable for solitary locusts, but the vegetation is scanty and during the dry period they occur only in the places where there is ground water. Since the rainfall is irregular and patchy, a concentration might well occur in spots that received rain, but further studies in this area are required.

The soils, vegetation and climate of each area are described in detail. A series of microclimatic observations made in different habitats are recorded, and the behaviour of adult locusts correlated with the daily changes in temperature.

Ecological observations on other Acridids are described It was found that the solitary *Schistocerca* adults formed but a small part of the Acridid population in any habitat. In comparison with the other Acridids, *Schistocerca* proved to have the greatest range of food-plants, including those that remain green all the year round.

Michelmore (A. P. G.) & Allan (W.). **Observations on Phases of the Red-winged Locust in Northern Rhodesia.**—*Bull. ent. Res.* **25** pt. 1 pp. 101–128, 5 figs. London, March 1934.

The observations on which this paper is based were carried out in Northern Rhodesia during the 1932–33 breeding season of *Nomadacris septemfasciata*, Serv., when its swarms invaded the settled areas of the country. Detailed descriptions are given of the egg, the vermiform larva and the six hopper instars of ph. *gregaria*, and the morphological features serving to distinguish the stages are discussed in detail and illustrated. The colour pattern of ph. *dissocians* is analysed in comparison with that of ph. *gregaria*. The occurrence of ph. *dissocians* in the field is described, with reference to the probable factors causing variation in certain characters. Hoppers of ph. *congregans* were observed in the field, but no characters could be found to distinguish them from those of ph. *dissocians*.

Cage experiments in breeding hoppers under varying degrees of crowding indicated that development of *gregaria* colouring is connected with the activity induced by crowding. Hoppers of an aberrant pallid coloration usually proved to be infested with one or two Nematodes. The effects of parasitism on the colour pattern are in a certain degree comparable with those of the factors responsible for the appearance of the *dissocians* type of coloration, but different parts of the colour pattern do not react to parasitism and to *dissocians* factors in the same way.

The changes in the adult coloration of both ph. *gregaria* and ph. *dissocians* are described. Cage experiments suggest that swarm colouring in the adult is affected by the degree of crowding, but the development of the red and purple coloration of the hind wing in *gregaria* and *dissocians* is affected by different factors, and it is probable that the pigments are not identical.

Biometrical data based on a large amount of material established definite measurable characters that may be used to distinguish the two phases.

Nikol'skaya (M.). **List of Chalcid Flies (Hym.) reared in U.S.S.R.**—*Bull. ent. Res.* **25** pt. 1 pp. 129–143, 3 figs. London, March 1934.

Separate lists are given of Chalcidoids reared in the Russian Union, chiefly during 1924–32, showing the plant or insect from which each was obtained and the date and place of record, and of the food-plants and insect hosts.

The following new Eurytomids are described and illustrated in the appendix: *Eurytoma onobrychidis*, reared from seed-pods of *Onobrychis sativa* in Poltava; *E. plotnikovi*, from the fruit of *Pistacia vera* in Turkmenistan; and *Systole coriandri*, from seeds of *Coriandrum sativum* in the North Caucasus.

[Kirichenko (A.).] Kiričenko (A.). **Description of some new Coccidae (Hemiptera) from Turkestan and Ukraine.**—*Trav. Inst. zool. Acad. Sci. URSS* **1** pp. 135–142, 1 fig. Leningrad, 1932. (With a Summary in Russian.) [Recd. March 1934.]

The six new species described include *Trionymus tritici*, found under the leaf-sheaths of *Agropyrum repens* and on sprouting wheat near

Odessa, and *Phenacoccus turanicus*, observed on the roots of cotton in Armenia and on those of *Stenophragma sophia* and *Astragalus bactrianus* in Uzbekistan.

PESCOTT (R. T. M.). **Insect Pests of the Cherry.**—*J. Dep. Agric. Vict.* **32** pt. 2 pp. 93–94, 1 fig. Melbourne, February 1934.

Brief notes are given on the bionomics and control of the chief insect pests of cherry in Victoria, *viz.*, *Myzus cerasi*, F., *Caliroa limacina*, Retz., *Cryptophasa* (*Maroga*) *unipunctata*, Don. (cherry borer moth), *Diphucephala colaspidoides*, Gyll. (cherry green beetle), *Aspidiotus perniciosus*, Comst., and *Chloroclystis laticostata*, Wlk. The adults of *D. colaspidoides* [*cf. R.A.E.*, A **21** 554] are found on cherry, particularly in the hill districts, from mid-summer onwards. Infested trees should be sprayed with 1 lb. lead arsenate to 25 gals. water. *C. laticostata*, a native Geometrid, overwinters in a cocoon in the soil, emerges in early spring and oviposits on the foliage and twigs of cherry. The larvae, which are first observed in early October, feed on the half-grown green cherries, infection with brown rot being associated with the injury. Lead arsenate should be applied when the larvae are first noticed.

SMITH (J. H.). **Banana Thrips and the Problem of its Control.**—*Qd agric. J.* **40** pt. 6 pp. 508–524 ; **41** pt. 1 pp. 5–29, 3 pls., 8 refs. Brisbane, December 1933–January 1934 ; also *Bull. Div. Ent. Pl. Path. Dep. Agric. Qd* no. 9, 41 pp., 3 pls., 8 refs. Brisbane, 1934.

Scirtothrips signipennis, Bagn., the feeding of which causes banana rust [*cf. R.A.E.*, A **13** 452], has recently spread from northern Queensland throughout the State, although it is not always a serious pest. Rusting, the nature of which is discussed, is much more pronounced where there has been some abnormality in the growth of the bunch. The longer the bud remains in close contact with the throat of the plant, the larger will be the number of adult thrips that migrate to the bunch for oviposition. Delayed inversion of the bunch also prolongs the period in which the young thrips feed on the whole fruit surface, instead of being restricted (as they are later by their need for shade) to the sheltered parts. Such abnormalities are especially frequent during dry spells. The recent increase in losses [**19** 222 ; **21** 105] may be associated with deterioration in many plantations.

As inert dusts such as kaolin and talc restrict the feeding of the thrips, the reduction of rusting sometimes obtained with lead arsenate is probably due entirely to the physical properties of the spray or dust. The use of inert dusts in the field is, however, limited by their lack of adhesiveness and by frequent rain during summer. A very finely divided proprietary precipitated sulphur dust characterised by a greyish colour gave promising results. Weekly dustings with nicotine gave fairly good control of unusually severe infestations. It is suggested that, where control measures are economically justified, a dust of free nicotine (rather than the sulphate) and hydrated lime should be applied with a rotary duster of which the feed arm has been converted to the flexible type. Dusting before the bracts are shed is probably useless. Where a grower may expect his plantation to last over several years, he should aim chiefly at producing winter and spring crops, so that the bunches may develop in the season when the thrips are least active.

WEDDELL (J. A.). **Banana Weevil Borer Control.**—*Qd agric. J.* **41** pt. 1 pp. 51–53; also as *Adv. Leafl. Dep. Agric. Qd* no. 9, 4 pp. Brisbane, 1st January 1934.

An account is given of the bionomics of *Cosmopolites sordidus*, Germ. (banana weevil borer) in Queensland and measures for its control [*cf. R.A.E.*, A **14** 128; **16** 533; **19** 694].

WOMERSLEY (H.). **A preliminary Account of the Bdellidae (Snout Mites) of Australia.**—*Trans. roy. Soc. S. Aust.* **57** pp. 97–107, 2 figs., 6 refs. Adelaide, December 1933.

In view of the discovery that *Smynthurus viridis*, L., in Western Australia is controlled in certain areas by the Bdellid mite, *Biscirus lapidarius*, Kramer [*R.A.E.*, A **21** 408], a systematic study of the Australian Bdellids has been made. Although the family as a whole is known to be predatory, none of the other 13 species found appeared to exercise any control of *Smynthurus*. The specific and generic characters of these species (4 of which are new) are given with keys.

WOMERSLEY (H.). **On some Acarina from Australia and South Africa.**—*Trans. roy. Soc. S. Aust.* **57** pp. 108–112, 1 fig., 10 refs. Adelaide, December 1933.

The aim of this paper is to elucidate the nomenclature of the mite known as the red-legged earth mite in Western Australia and as the black sand mite in South Africa, and that of a closely allied species. *Halotydeus* (*Penthaleus*) *destructor*, Jack, was recorded from Cape Province in 1908, but was first described in detail by Tucker in 1925 [*R.A.E.*, A **13** 524]. In the meantime it had been recorded from Western Australia [**11** 571; **14** 50] as *Penthaleus* (*Notophallus*) *bicolor*, Froggat, an allied species described from New South Wales [**9** 219]. This error was subsequently corrected [**14** 204]. *H. destructor* is very abundant and a serious pest in South Africa on market garden crops, and in Western Australia it is widely distributed in enormous numbers on subterranean clover [*Trifolium subterraneum*], Cape-weed [*Cryptostemma calendulaceum*] and many other plants. It also occurs in South Australia, Victoria, Tasmania, New South Wales and the Federal Capital Territory.

The Bdellid mite, *Odontoscirus virgulatus*, Can., was often found in South Africa in association with *H. destructor*, but did not attack it, although it preyed on various small Collembola and Psocids.

Penthaleus bicolor, Froggat, which is redescribed, has been found by the author in South Africa, where it was previously unknown, in all the localities where *H. destructor* occurred. In Western Australia it is similarly found, though not in such large numbers; in New South Wales it has been regarded as a serious pest, and in certain parts of South Australia as a minor one. It has also been received from Victoria and the Federal Capital Territory. No males of either *P. bicolor* or *H. destructor* have yet been discovered, and both would appear to be largely parthenogenetic. The author believes that as each mite occurs in both countries, and as *P. bicolor* may possibly be synonymous with the European *P. major*, Dug., or *P. haematopus*, Koch, no detailed descriptions of which have been published, they have probably been introduced into Australia and South Africa. The European species has been recorded occasionally as a pest in France, and the southern

Mediterranean region may be the native home of both mites. It is suggested that an investigation of this region may reveal some controlling agency.

The other mites recorded include one new Bdellid associated with Collembola in South Africa.

VAN HEERDEN (P. W.). **The Green Stink-bug** (*Nezara viridula* **Linn.**). —*Ann. Univ. Stellenbosch* **11** A no. 7, 24 pp., 11 figs., 9 refs. Capetown, December 1933.

An outbreak of *Nezara viridula*, L., occurred in gardens in Stellenbosch (Cape Province) in 1931–32. A list of 21 food-plants is given, and all stages are described. The sucking of the bugs often kills plants. and the punctures they make are points of entry for fungus diseases, This Pentatomid, which is not a pest of major importance in South Africa, appears to be more injurious in small gardens, where it can easily find alternative food-plants, than in areas where only a single crop is grown. The eggs are usually laid in masses [*cf. R.A.E.*, A **21** 678] on the lower surface of leaves. The largest number laid by a female was 320, in 5 masses. The nymphs hatched in 7–10 days and completed their 5 instars in 55–63 days. Hibernation (during which mortality is high) occurs in the adult stage, and there are two complete generations a year, with a partial third, only a few of the nymphs of which mature. Fifth-instar nymphs may be found in the field as late as June, but these usually die before the end of the winter. The generations overlap, and all stages are usually found throughout the summer. Sprays and dusts were unsuccessful unless of such a strength as to injure the plants. Hand-picking of all stages and clean cultivation are recommended.

REICHERT (A.). **Rosenschädlinge.** [Rose Pests.]—*Kranke Pflanze* **11** no. 3 pp. 33–35, 1 pl. Dresden, 1934.

In northern Germany, *Tortrix bergmanniana*, L., has one generation a year. The moths occur in June and early July and lay their eggs singly on the branches of wild or cultivated roses. The larvae hatch in the following April or May and spin up the terminal shoots, feeding on the leaves and buds. They pupate at the end of May on leaves, and the pupal stage lasts 2–3 weeks. In winter, the eggs can be brushed off the twigs.

SPEYER (W.). **Die Bekämpfung der Obstschädlinge und Bienenschutz.** [The Control of Fruit Pests and Bee Protection.]—*Kranke Pflanze* **11** no. 3 pp. 37–39. Dresden, 1934.

The author states that bees ingest insecticides applied to fruit trees as sprays only when they contain more than 1 per cent. of sugar or are mixed in the flowers with nectar or pollen, or when the bees themselves are wetted by the spray and try to clean each other. Fruit trees must not be sprayed when in full bloom, and flowering weeds growing beneath them should be mown.

BORCHERT (A.). **On the Breeding-places of the External Mite** (*Acarapis*) **on the Honey Bee.**—*Bee World* **15** no. 4 pp. 43–44. Camberley, Surrey, April 1934.

Examination in Germany during the winter of 1933–34 of 523 bees infested with *Acarapis woodi externus*, Morgenthaler, revealed two new

breeding places of the mite [*cf. R.A.E.*, A **19** 736; **22** 162], on the narrow part of the thorax between the points of attachment of the fore and hind wings (83 cases) and on the fore and hind wings themselves (349 cases), and almost always near the wing-roots. Both these breeding places lie near the first pair of openings to the tracheae, in which lives the pathogenic internal mite, *A. woodi*, Rennie.

ZWÖLFER (W.). **Goldkäferlarven** (*Cetonia aurata* **L.**) **als Saatbeetschädlinge.** [Cetoniid Larvae as Seed-bed Pests.]—*Anz. Schädlingsk.* **10** no. 3 pp. 25–29, 4 figs., 15 refs. Berlin, 15th March 1934.

The adults of *Cetonia aurata*, L., are known to destroy the blossoms of various cultivated plants, but the larvae are generally regarded as harmless [*cf. R.A.E.*, A **10** 294; **19** 641]. In June 1932, however, they injured pine seedlings in a seed-bed in Bavaria. The larva is described and compared with that of *Potosia cuprea*, F. (*floricola*, Hbst.), with which it appears to have been often confused. Humus in the ground is the normal larval food. In the laboratory, the pupae transformed at the end of September and early in October, but the adults remained inactive in the ground and hibernated, as did also a full-grown larva.

Careful observations with seedlings and soil from the affected bed showed that the continual burrowing of the larvae prevented normal growth, uncovered some roots and buried others unduly. The roots of plants withering or dying in consequence were directly attacked, but the main injury was due to the disturbance of the soil. Hand collection of the larvae (which are near the surface if the soil is moist) proved effective for control. They had been introduced with compost, and fumigation of the stock compost heap with paradichlorobenzene is suggested.

PRELL (H.). **Ueber die Dosis letalis minima des Arsens für Bienen.** [On the minimum Dose of Arsenic lethal to Bees.]—*Anz. Schädlingsk.* **10** no. 3 pp. 30–31. Berlin, March 1934.

With reference to the poisoning of bees in Germany by arsenical insecticides, it is pointed out that, owing to an error in calculation, a widely quoted statement by Borchert (1929) that the lethal dose is 0·003 mg. As_2O_5 or 0·002 mg. As is incorrect. The true minimum lethal dose, as shown by Borchert's experiments, is under 0·001 mg. As.

BUHL (C.). **Beitrag zur Biologie des** *Thrips angusticeps* **Uz.**—*Anz. Schädlingsk.* **10** no. 3 pp. 31–34, 2 figs., 10 refs. Berlin, March 1934.

The increase of *Thrips angusticeps*, Uzel, on early cabbage in western Schleswig-Holstein since 1917 made control measures necessary in 1932 [*R.A.E.*, A **21** 528]. In 1933, the attack began on 24th April, immediately after the cabbages had been planted out, the leaves being covered with silvery spots and curled from the edges. It reached its maximum on 28th April, but many adults were still on the plants on 5th May, all being short-winged and incapable of flight. As 329 females were noted and only 4 males and pairing was observed once only, reproduction was probably parthenogenetic. The eggs are laid in tender leaves, with the tip projecting. Eggs found in the field on 5th May

hatched three days later. In the laboratory at 18–22°C. [64·4–71·6°F.], incubation lasted 6–8 days and the first larval instar 5–7; the second instar comprised 4–6 days' active feeding and 1–2 days' resting in the ground, the pre-pupal stage lasted 1–2 days and the pupal 4–5. Of this (long-winged) generation, 4 females with mature eggs were found on 10th June, when the short-winged form was represented only by second-instar larvae and a few females. On 4th July, long-winged adults were abundant on the cabbage heads, females predominating (112 : 5). In the first instar, which lasted 4–5 days, the larvae remained on the tender leaves; in the second, they fed for 5–8 days on both young and old leaves. The resting stage in the ground (at the end of July and in August) lasted 6–8 days, the pre-pupal stage 2–3 and the pupal 4–6. This (short-winged) generation apparently overwinters in the ground.

SPRINGENSGUTH (W.). **Zur Bekämpfung des Rapsglanzkäfers mit Esturmit.** [On the Control of the Rape Beetle with Esturmit.]—*Anz. Schädlingsk.* **10** no. 3 p. 36. Berlin, March 1934.

In Prussian Saxony in 1932, the application of an arsenical dust (Esturmit) to plots of cabbage, etc., during the chief flowering period (at the end of May) effectively controlled the rape beetle [*Meligethes aeneus*, F.] but also killed large numbers of bees. In 1933, the same insecticide was used when the flowers were still in bud; the beetle was effectively controlled, and no bees were killed.

BUTOVITSCH (V.). **Om skadeinsekternas ekonomiska betydelse för skogshushållningen.** [On the Economic Importance of Insects injurious to Forestry.]—*Svenska SkogsvFören. Tidskr.* 1934 no. 1–2 pp. 1–10, 20 refs Stockholm, 1934. (With a Summary in German.)

The calculation in money values of losses due to insect pests is far less exact in forestry than in agriculture. In cold countries the greatest damage is done by pests that occur regularly, sudden outbreaks being comparatively rare. The various types of loss due to such permanent pests are discussed, with special reference to Sweden.

FORSSLUND (K. H.). **Tallbockens (*Monochamus sutor* L.) uppträdande på brandfält i norra Sverige sommaren 1933.** [The Occurrence of *M. sutor* in burnt Areas in northern Sweden in the Summer of 1933.]—*Svenska SkogsvFören. Tidskr.* 1934 no. 1–2 pp. 23–38, 6 figs., 6 refs. Stockholm, 1934. (With a Summary in German.)

In the summer of 1933, large areas of pine and spruce in northern Sweden devastated by fire were invaded by adults of *Monochamus sutor*, L., that were attracted by the smell of burning [*cf. R.A.E.*, A **18** 269]. In August, when cutting and barking were begun, the larvae had already entered the trunks, and experiments showed that even at this stage the bast and outer layer of the sap-wood were necessary for food. After removal of the bark, the average length and activity of the larvae found decreased visibly. In their search for new bark, they almost entirely ceased to lengthen the original mine and bored lateral ones close beneath the surface. Remnants of bast left adhering only provided food for a short time, because they soon dried up. The timber does not therefore require to be peeled white.

Feeding by the adults was general and consisted of gnawing the silver bark of pine or spruce or the needles of pine. Oviposition began in July, immediately after the fires, and lasted until early September.

The chief natural enemies of *M. sutor* are woodpeckers, which appear in large numbers in burned areas. Although parasites and predators were occasionally found in its tunnels, they probably play a negligible part in control.

[Spesivtzev (P. N.).] Spessivtseff (P.). **Zur Lebensweise des schwarzen Fichtenbastkäfers** (*Hylastes cunicularius* **Er.**). [On the Biology of *H. cunicularius*.]—*Svenska SkogsvFören. Tidskr.* 1934 no. 1–2 pp. 207–220, 6 figs., 26 refs. Stockholm, 1934. (With a Summary in Swedish.)

Observations over many years on *Hylastes cunicularius*, Erichs., a pest of spruce in Sweden, show that this Scolytid normally breeds and feeds underground. The brood galleries occur on the underside of fallen spruce trunks, in the roots of stumps or in injured roots of standing trees. The occurrence of mines on the aerial parts of stumps, in or under the bark, is exceptional. The adults also make mines in the course of feeding. Oviposition begins at the end of May in the south of the country and at the end of June in the north. The larvae hibernate. In central and northern Sweden, the first pupae are found about the beginning of July and the first adults in mid-July. The immature adults feed gregariously and then hibernate in the ground-litter. In spring they feed singly before breeding. They often attack and sometimes kill young trees, and it is to this habit that the economic importance of the species is due. Sexual maturity is reached in this (third) year. Of overwintered adults in field cages, 32 per cent. were old ones that had already bred in the preceding year. These beetles produce another brood in their fourth year.

Trees 3–10 (more rarely 2) years old are frequently attacked by the adults in felled areas, but seldom in stands, where a sufficient supply of older trees is available. In the first year after felling, the stumps are usually still too fresh for the beetles to breed in, but in the next year the roots of most stumps are attacked. From mid-summer in the third year, the young adults emerge and, the stumps being unsuitable, either attack young plants in the felled area or migrate. It is therefore desirable to cultivate felled areas by sowing in the second year or planting in the third, so that the trees are too young to provide suitable food when the new adults emerge.

The life-history of *H. cunicularius* resembles that of *Dryocoetes autographus*, Ratz. [*R.A.E.*, A **17** 57], and as both species are found in roots and fallen trunks of spruce in Sweden, a note is given showing the differences in the larvae and pupae.

Trägårdh (I.). **Om primära och sekundära skogsinsekter.** [On primary and secondary Forest Pests.]—*Svenska SkogsvFören. Tidskr.* 1934 no. 1–2 pp. 275–290, 1 fig., 7 refs. Stockholm, 1934. (With a Summary in German.)

Considerable attention has been directed to the danger of outbreaks of bark-beetles in Sweden as a result of damage in forests by very severe storms in 1931 and 1932. The author discusses the conditions governing

an increase of these pests, including such factors as potential rate of increase, sex-ratio, breeding opportunities and other biotic and abiotic conditions.

Schaeffer (C.). **Onderzoek over de karwijmot** (*Depressaria nervosa* **Hw.) en haar bestrijding.** [An Investigation on the Caraway Moth and its Control.]—*Versl. Meded. PlZiektenk. Dienst* no. 74, 28 pp., 4 figs., 4 pls., 20 refs. Wageningen, January 1934.

The only important pest of caraway [*Carum carvi*] is *Depressaria nervosa*, Haw., which has recently caused serious injury in Holland [*cf. R.A.E.*, A **15** 509], where these investigations were made in 1933.

The adults hibernate in sheltered situations. The flight period (as observed by means of trap jars containing sugar solution and a few drops of oil of geranium) lasted from 4th March to 17th May, with a very pronounced peak on 11th and 12th April. There were 515 males to each 100 females. Adults survived for 15 days in closed boxes without ventilation or food. The eggs, which are laid on the blades or stems of the leaves, were very resistant to night frosts, heavy rain and drought. The first eggs were seen on 27th March, and the majority had hatched by 10th May. The larvae feed on the leaf-stems and move upwards to the umbels, which they reach when nearly full-grown. After gnawing the stems of the umbels, which are sometimes completely destroyed, they web together the flowers and flower-buds. On 2nd June, they began to descend from the umbels and to bore into the stems, within which they pupated. The resulting adults, which were observed between 9th and 25th July, entered hibernation without feeding or ovipositing, there being thus one generation a year. Early-flowering plants suffered most.

A detailed account is given of a large number of experiments with insecticides. Against the eggs, oil emulsions sprayed at the rate of about 120 gals. per acre gave good results. It was found more effective, however, to apply two treatments against the young larvae, 4 weeks after the main flight and 7–10 days later, sodium and barium fluosilicates being the best materials. They should be used in large quantities, either as dusts or sprays, and should be applied between the plants, in order to ensure that the stems are reached.

Destruction des chenilles.—*Avis aux cultivateurs Off. hort. Minist. Agric.* Sér. Varia no. 5, 22 pp., 15 figs., 4 col. pls. Brussels, 1932. Price *Fr.* 1.50. [Recd. March 1934.]

This paper contains brief notes on the bionomics and control of the principal Lepidoptera that feed on the leaves of fruit trees in Belgium.

[Mayné (R.).] **La mouche des cerises** *Rhagoletis cerasi* **L.**—*Avis aux cultivateurs Off. hort. Minist. Agric.* Sér. Varia no. 9, 8 pp., 1 col. pl. Brussels, 1932. Price *Fr.* 1. [Recd. March 1934.]

In view of the possibility of the introduction of *Rhagoletis cerasi*, L. (cherry fruit-fly) into Belgium, where it has not yet been recorded, an account is given of its bionomics and measures employed for its control. The importation into Belgium of raw cherries from Germany, France and Italy is only permitted subject to inspection.

[Scheerlinck (—).] **Principaux insectes et maladies de l'***Azalea indica*.—[*Publ.*] *Off. hort. Minist. Agric. Cl. moyennes.* Sér. phytopath. no. 3, 21 pp., 6 figs., 2 col. pls. Brussels, 1933. Price *Fr.* 2. [Recd. March 1934.]

The chief pests of *Azalea indica* in Belgium are enumerated, and notes are given on the three most important [*cf. R.A.E.*, A **16** 499]. The eggs of *Heliothrips haemorrhoidalis*, Bch., hatch in 6–8 days, and the life-cycle is completed in 30–35 days at a moderate temperature or in less than 20 days in the hothouse, where over 12 generations may occur in a year. The measures recommended in greenhouses are: good ventilation; avoidance of high temperature; spraying the plants with cold water to destroy the larvae on the lower surface of the leaves; spraying with 1·5 or 2 parts nicotine and 20 parts soap in 1,000 parts rain-water or with an extract of 2–3 lb. tobacco leaves in 10 gals. water; dusting with tobacco or pyrethrum; and fumigation with tobacco smoke, or with calcium cyanide (cyanogas) at the rate of about 0·27 oz. to 1,000 cu. ft. [*cf.* **15** 171].

The young larvae of *Gracilaria azaleella*, Brants, remain for about 20 days in the mines [*cf.* **15** 118, 286] and about 30 within the curled leaves; in the course of its life, one larva can attack three leaves. Sometimes several larvae are found on the same leaf. The pupal stage lasts 15–20 days. The adults are on the wing at night. There are two generations a year, the first occurring from mid-April to mid-July and the larvae of the second appearing in August. In greenhouses, larvae and adults are present throughout the year. Infested leaves should be destroyed or the larvae in them crushed. Fumigation with tobacco or calcium cyanide, etc., against the adults should be carried out in the evenings from February onwards at weekly intervals. From mid-April to mid-May, the plants in greenhouses should be sprayed with insecticides once a week, preferably in the morning, this being the time when the larvae abandon the mines and migrate to curl the tips of the leaves. During the summer, the plants taken out of doors should be sprayed every 4–5 weeks with an arsenical (1 lb. lead arsenate paste to 10 gals. rain-water, or 1 lb. Urania green with 5 lb. freshly slaked lime to 100 gals.). The adults in the field should be destroyed by applying jets of water to hedges, where they usually shelter, or by light-traps. Small kerosene lamps placed in receptacles with water caught 4,295 moths in 18 days in 12 greenhouses.

Peronea (*Oxygrapha*) *schalleriana*, L., has two generations a year. The overwintered eggs hatch about the end of March, the larvae web together the buds and young leaves, pupating about the end of May inside this shelter, and the adults emerge in June. The larvae of the summer generation appear in July-August, and the adults emerge in September. In hothouses, a third generation has been observed to occur in winter. The measures recommended are: catching and killing the adults; crushing the larvae and pupae; and spraying with lead arsenate or Urania green a few days before the eggs hatch.

Malenotti (E.). **Contro gl'insetti delle granaglie.** [Against Grain Pests.]—*G. Agric. Domenica* 1933 no. 49 reprint 4 pp. Rome, 3rd December 1933. [Recd. March 1934.]

A liquid fumigant, sold in Italy as Silosan and stated to be a mixture of chlorinated compounds, has given good results against a Bruchid

infesting stored seeds of *Lathyrus cicera* when used at the rate of 3 oz. to 10 cu. ft. At 3½ oz. to 10 cu. ft., it proved satisfactory against *Silvanus surinamensis*, L., and *Tribolium confusum*, Duv., infesting wheat. It reduced the germinative power of the wheat to 61 per cent. from an initial 84 per cent.

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